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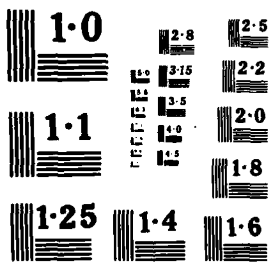
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U.S. NAVY CLIMATIC STUDY OF THE CARIBBEAN SEA AND GULF OF MEXICO VOLUME 1

WEST CARIBBEAN SEA AND CENTRAL AMERICAN WATERS

SEPTEMBER, 1985

PREPARED BY
NAVAL OCEANOGRAPHY
COMMAND DETACHMENT,
ASHEVILLE, N.C.

PREPARED UNDER
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The U.S. Navy Climatic Study of the Caribbean Sea and Gulf of Mexico is made up of four volumes which were prepared under the Commander, Naval Oceanography Command and by the Officer in Charge, Naval Oceanography Command Detachment, Asheville, North Carolina. The work was performed at the National Climatic Data Center (NCDC).

Geographical and Data Coverage

This series of four volumes covers the Central American Waters from the Gulf Coast of North America to the northern coast of South America. The following figure shows the areas covered by each volume, and how they overlap to provide coverage for the entire region.

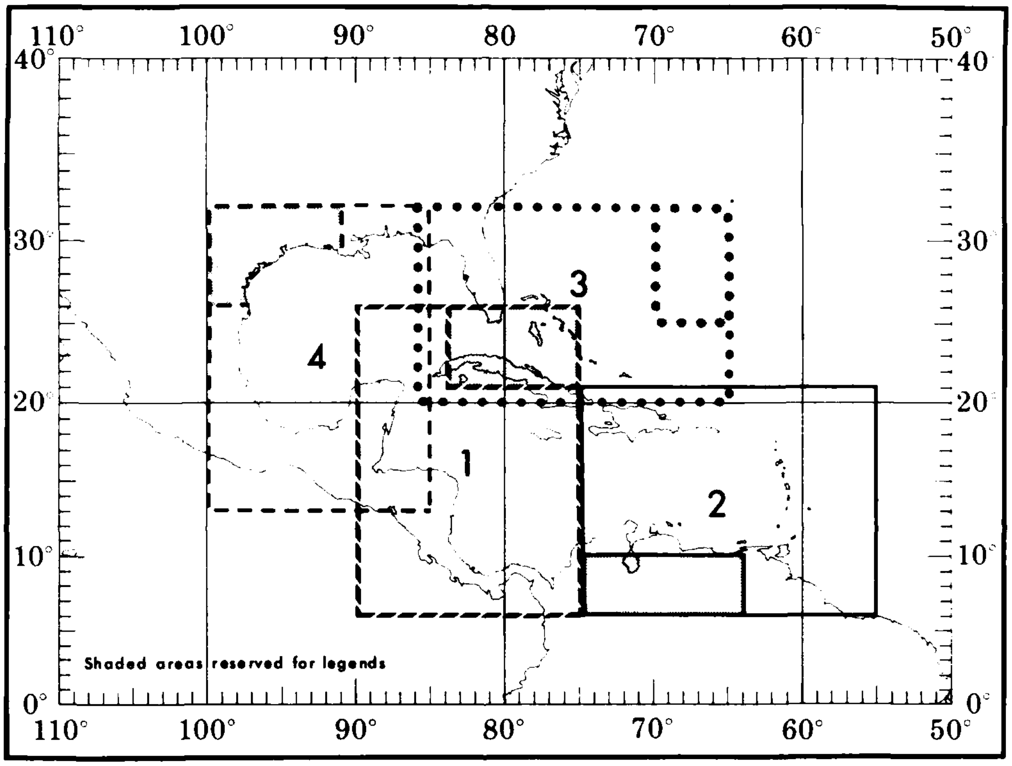


FIG. 1 AREA COVERAGE OF VOLUMES 1-4

This first volume, "West Caribbean Sea and Central American Coastal Waters," covers Region 1 as outlined on the above map (Fig. 1). It extends from south of the Isthmus of Panama (the Canal Zone) to just north of the Yucatan Channel (6°N to 24°N; 75°W to 90°W).

Greatest effort and detail were given to the charts and analyses of the marine areas. Surface marine statistics are presented on monthly charts in the form of graphs, tables, and isopleth maps. Land station data appear mostly as graphical presentations within the text. A significant problem in trying to define the climate over many of the areas of Central and South America is the lack of data. Political instability and changing economics create periods when little observational data are collected, and in many cases where data does exist it is often fragmented and neither summarized nor published. For some regions only early data collected by the European colonialists are available.

The marine data were machine plotted by one-degree quadrangle and then subjectively analyzed. Graphs and tables of marine-area data are also presented by one-degree quadrangle (visibility, wave heights, and wind roses). These graphs and tables represent the objective compilation of available data. Those data were not adjusted for suspected biases (low observation count, heavy weighting of observations during a short time interval, biases in coding of observations from various source decks, etc.), hence differences may be found when comparing the graphic data with the isopleth analyses. The total number of observations for a given one-degree square should always be considered when interpreting the data as there may not be a sufficient number to permit representative statistics.

Over a million and a half surface marine observations were used in computing the statistics in this volume, and over six million for the total region (4 volume set). These data, taken from NCDC's Tape Data Family 11 (TDF-11), were collected by ships of various registry from as early as 1854 to as recent as 1983, with the bulk of the observations being collected in the last 30 years. This is significant because more recent observations contain more elements than pre-1948 reports. Observation density is greatest along the major shipping routes. In this study area most traffic moves north-south passing through the Panama Canal and either the Mona Passage (between Puerto Rico and Hispaniola) or the Windward Passage (between Hispaniola and Cuba). A very high density of traffic is also found along the east coast of Florida, in the Straits of Florida, and in routes to and from the U.S. Gulf Coast ports.

The sea surface current information was extracted from the Naval Oceanographic Office Special Publications 1400-NA6, 1400-NA9, and 1402-NP13, Surface Currents West Central North Atlantic Ocean Including East Coast of the United States, Surface Currents Southwest North Atlantic Ocean Including the Gulf of Mexico and Caribbean Sea, and Surface Currents Southeast North Pacific Ocean Including the West Coast of Central America, respectively.

Physical Features

Four major physical-geographic regions are found within the four-volume study area: the mountains (highlands) of Central America and northwest South America, the tropical savanna of eastern Mexico and Pacific Coast of Central America, the humid subtropical across the southern United States, and the tropical rainforest along the southeastern Atlantic Coast of Central America and on the windward (eastern) side of most of the West Indies Islands.

Low-lying coastal plains cover a rather wide expanse across the southern United States. Elevations remain below 600 feet for some 150 to 200 miles inland before reaching the foothills of the Appalachians in northern Alabama and Georgia, the Ouachita Mountains of Oklahoma and Arkansas, or the Edwards Plateau in Texas. A much narrower coastal plain extends down the east coast of Mexico and it is a relatively short distance inland before the rapidly rising escarpment of the Sierra Madre Oriental Mountains is encountered. Atop this range is a relatively flat plateau extending a major portion of the length of Mexico with mountain peaks reaching 18,000 feet across its southern end. Similar elevation changes and narrow coastal plain occur along the west coast of Mexico where the Sierra Madre Occidental mountain range borders the plateau (reference Topographic Chart, Fig. 2, and geographical locator chart Fig. 3). A rather abrupt break in the mountain range occurs at the southern end of the Bay of Campeche which provides a narrow passage between the Atlantic and Pacific (known as the Istmo de Tehuantepec). Similar breaks occur in southern Nicaragua and across Panama. From the Istmo de Tehuantepec a rather broad coastal plain extends across the Yucatan Peninsula and along the Atlantic Coast of Honduras and Nicaragua. Rugged mountains again rise along the west coast with heights reaching above 13,000 feet in Guatemala and 11,000 feet in Costa Rica.

Two chains of active volcanic ridges extend along the major earthquake faults; one chain runs up the Lesser Antilles Island group and the second up the west side of Central America from Colombia to southern Mexico. Scattered throughout the West Indies are numerous islands with the majority falling along the major fault line, this creates the semblance of a stepping-stone pattern from Florida to Venezuela. The larger islands in the group (Cuba, Hispaniola, Jamaica, and Puerto Rico) form the Greater Antilles, and the smaller islands (Virgin Is., Windward Is., Leeward Is., and the islands in the southern Caribbean north of Venezuela) extending south from Puerto Rico to South America, the Lesser Antilles. The Bahama Islands, which lie to the southeast of Florida and north of Cuba, are the third and final major group making up the West Indies.

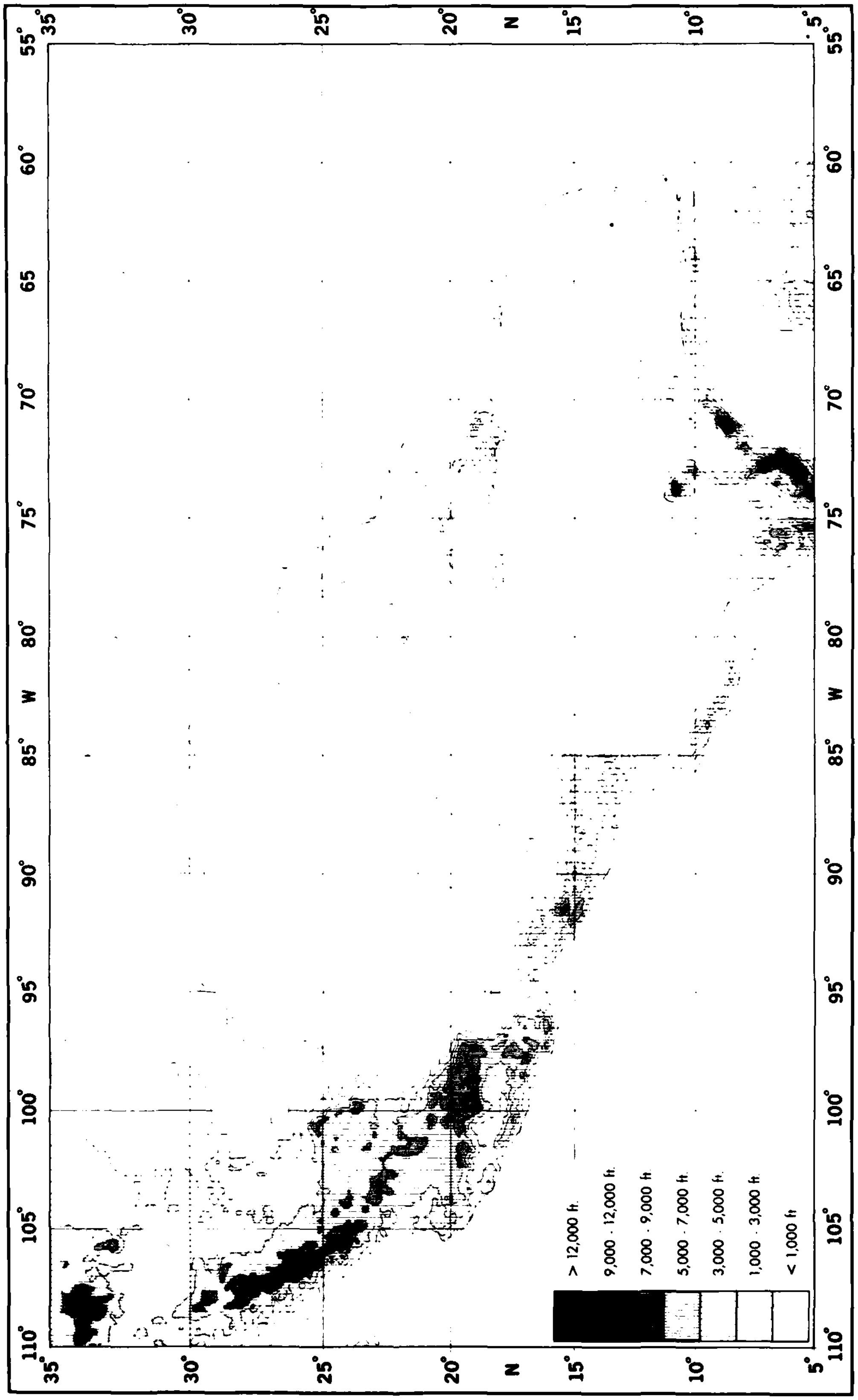


FIG. 2 TOPOGRAPHICAL CHART

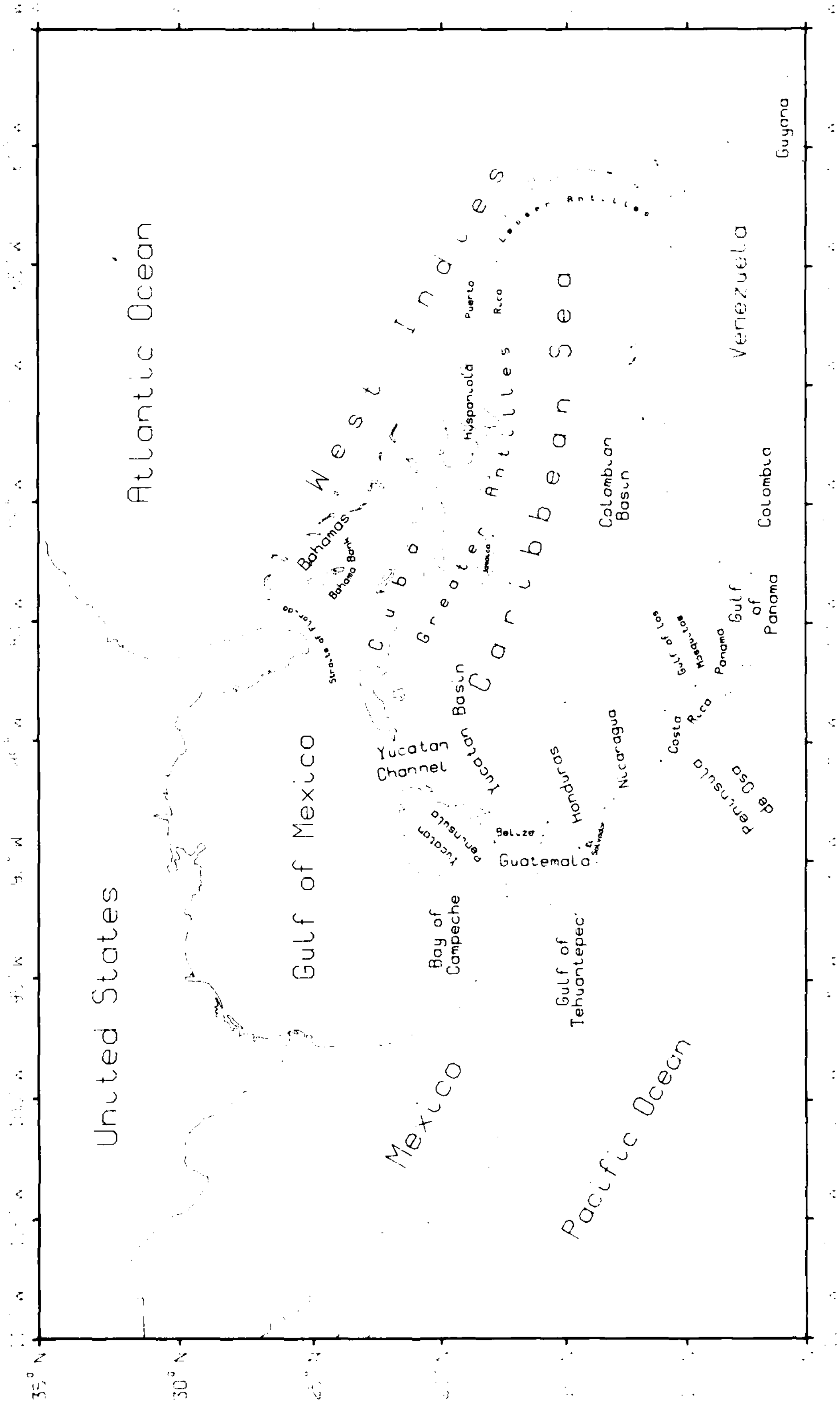


FIG. 3 GEOGRAPHICAL LOCATOR CHART

Highest elevations in the West Indies are found on Hispaniola where peaks reach above 10,000 feet. Peaks as high as 7,000 feet are located on Jamaica with elevations reaching 6,000 feet in southern Cuba. Four-thousand foot peaks occur on Puerto Rico and a few of the smaller islands. Much lower peaks are found on the remaining islands.

Figure 4 shows the bathymetry (water depths) of the Central American Waters. A broad continental shelf lies along the west coast of Florida extending along the U.S. Gulf Coast narrowing somewhat near the Alabama-Florida state line but then broadening out again until reaching northern Mexico. A rather narrow continental shelf extends down the east coast of Mexico before widening out significantly along the northwest coast of the Yucatan Peninsula. Another broad shelf area extends from northeast Honduras east towards Jamaica. Other broad continental shelf areas include the Bahama Bank, northeast coastal region of South America, and a couple of smaller areas along the west coast of Cuba. Along the Pacific Coast of Central America a narrow continental shelf runs the full length of the coast except for the Gulf of Panama.

Depths of over 12,000 feet are found in only a few regions of the Gulf of Mexico, but they are rather common in the Caribbean basin. Bathymetry surveys have shown depths of over 20,000 feet in the Cayman Trench just south of the Cayman Islands and over 25,000 feet, the deepest in the Central American Waters, in the Puerto Rico Trench which lies just north of the island.

Climate

Northern portions of the Central American Waters lie in the subtropics while southern sections lie within the tropics. This generally means that the Caribbean Sea is under the influence of the easterly trade winds and the northern part of the Gulf of Mexico, the mid-latitude westerlies. Although most segments of the region will feel the effects of both tropical and subtropical conditions, an ill-defined zone exists between the two that is much more subject to both influences. During the winter, cold air occasionally pushes deep into the Gulf of Mexico with westerly winds often being observed as far south as the southern end of the Mexican Plateau. However, their appearance this far south is often related more to altitude than latitude. The structure of the trade winds is generally rather shallow with the easterlies normally giving way to the upper westerlies (antitrades) above 3,000 to 5,000 feet.

The general circulation over the area is mostly controlled by the North Atlantic subtropical high commonly known as the Azores or Bermuda high (Fig. 5). Flow along its southern edge produces the large scale northeastern flow known as the trades, the most globally consistent winds for directional constancy. Trade winds are at their weakest during the winter, the dry season, and their strongest during the summer, the wet season. The trades do not generally contain a deep moist layer because of an inversion that usually appears at 3,000 to 5,000 feet above mean sea level. Below this inversion it is quite moist whereas above the inversion it is relatively dry and cloudless. An almost mirror image of the trade wind inversion appears between the northern and southern hemispheres. Equatorward of 15° latitude the inversion rises both westward and equatorward to heights of over 6,000 feet, encircling the equatorial trough. Termination of the trade wind inversion usually takes place in the middle latitudes and variations in the inversion for given locations have proven significant between individual observations (Riehl, 1979). Within the equatorial trough zone and over western portions of the trades the inversion often disappears and it is not considered to be a mean condition. Broad scale subsidence of air within the subtropical high establishes the trade wind inversion. The greatest descent of air takes place across the high's southeastern quadrant which causes the inversion to be generally lower and stronger over the eastern portions of the ocean.

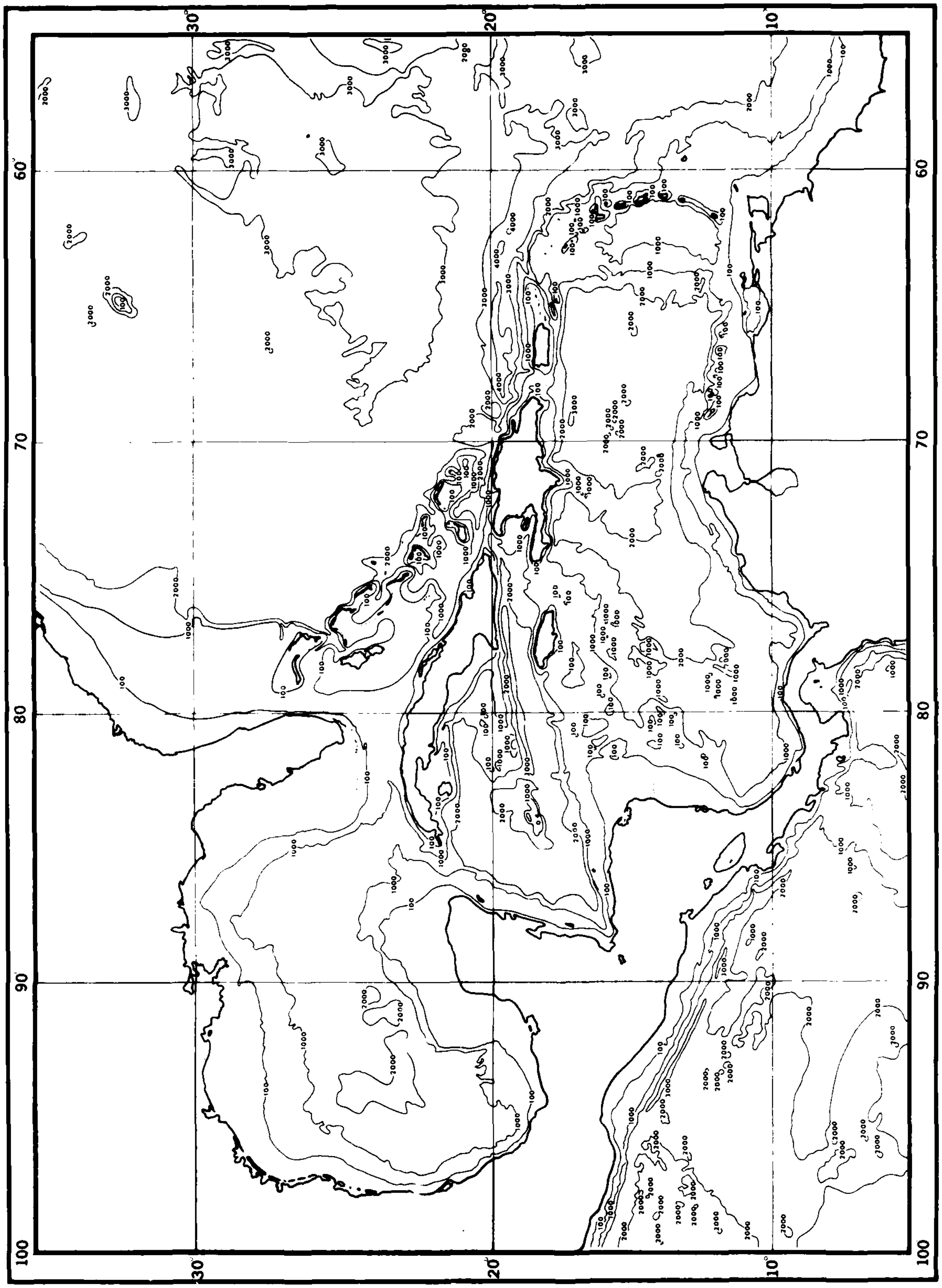
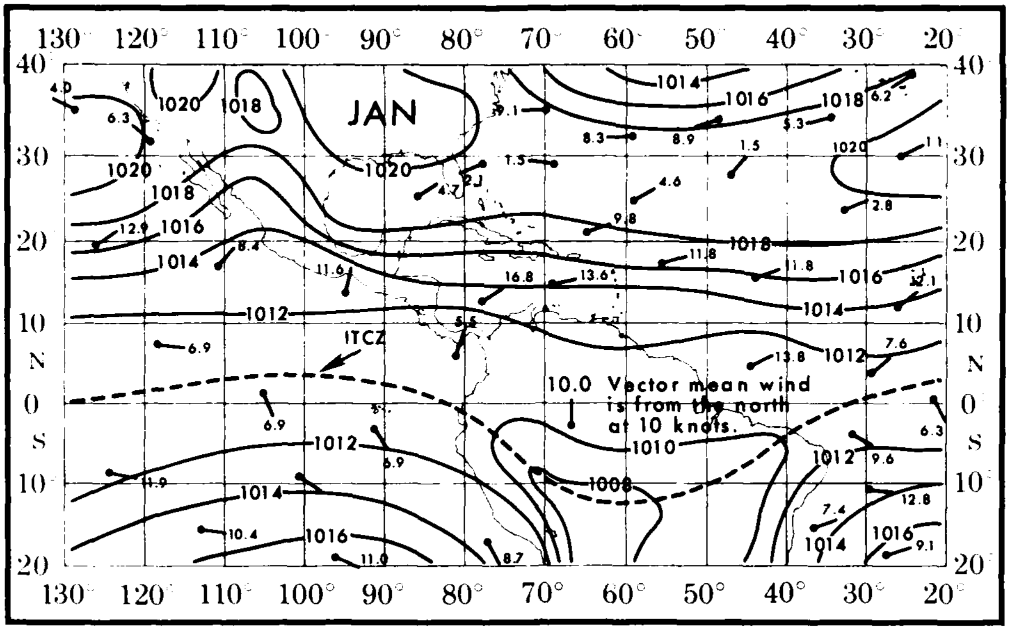


FIG. 4 BATHYMETRY CHART



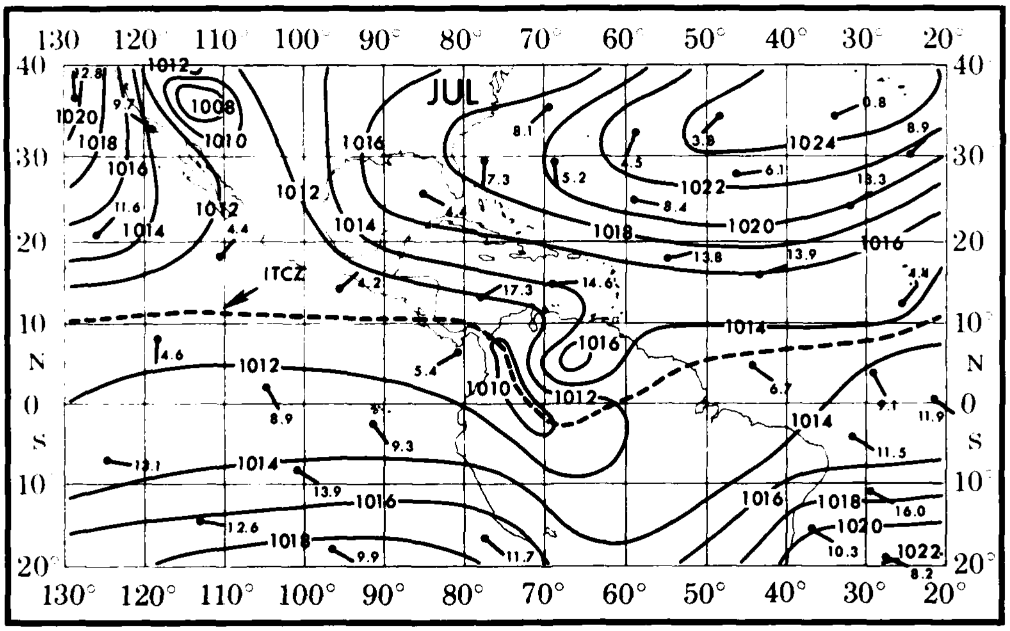


FIG. 5 MEAN EQUATORIAL TROUGH AND VECTOR MEAN WINDS

The Intertropical Convergence Zone (ITCZ), a belt of relatively low pressure lying between the subtropical highs of the northern and southern hemispheres, is another significant climatic feature. This belt is often referred to by many names such as the equatorial trough, trade wind trough, intertropical front, equatorial front, cyclonic directional shear zone, etc. It was originally described as the dividing line between the northeast and southeast trades. Continued research has shown this system to be much more complex, because it is not necessary for the equatorial trough, the wind convergence zone and maximum cloudiness to coincide. Godshall (1968) showed that a displacement exists between the maximum cloud cover areas and the convergence zone centers and that some of the displacements are quite large. Water vapor transferred from the sea to the atmosphere becomes trapped below the trade inversion and is thus transported to the ITCZ by the trade winds themselves (Augstein, 1976). A good schematic of this process, adapted from Augstein (1976), is shown in Figure 6.

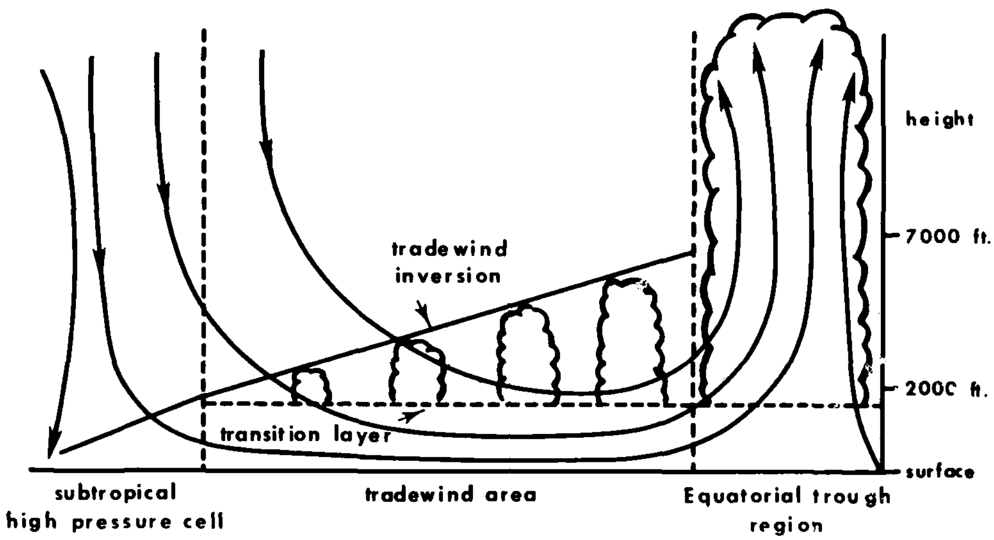


FIG. 6 EQUATORIAL TROUGH/TRADE WIND SCHEMATIC

Movement of the ITCZ, northward and southward, is in harmony with the sun's movement and the resultant strengthening and weakening of the subtropical highs. Studies have shown that the global seasonal progression has its smallest annual displacement between approximately 40°W and 160°W (Riehl, 1979; Balek, 1983) which results in the equatorial trough barely pushing into the Caribbean region even during its most northern extent. During the wet season the equatorial trough tends to lie northwest-southeast across southern Central America (see Fig. 5) affecting the eastern Pacific most significantly.

Continuous change is associated with the ITCZ, from periods of locally heavy downpours to those of clear skies. Large displacements of the zone itself are often observed. Typically there are regions experiencing heavy convective activity while others in close proximity are experiencing no significant weather. An example of such conditions within the ITCZ is seen in Figure 7 (NASA, 1977) where a continuous band of clouds appears over the eastern Pacific while some relatively clear areas appear over the Atlantic.

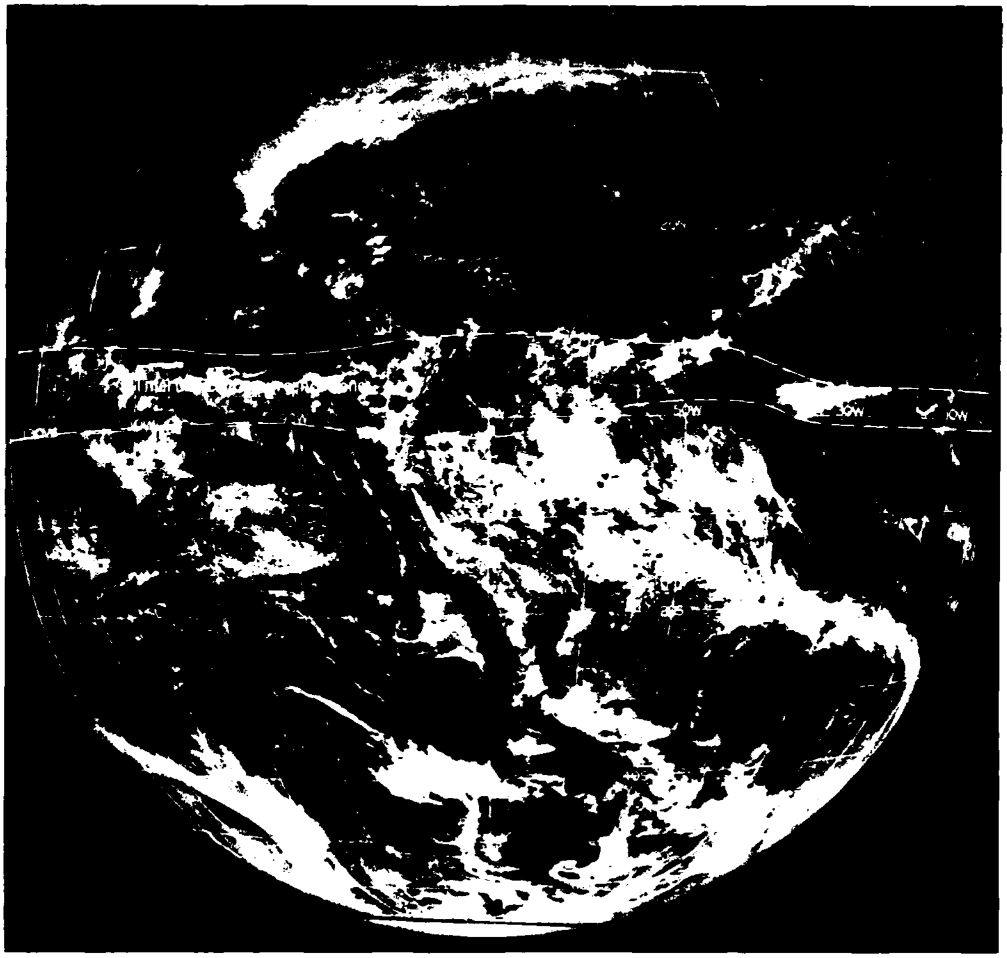


FIG. 7 SATELLITE SYNOPTIC IMAGE (JANUARY 3, 1974, 12:20 GMT)

Two distinct precipitation seasons are typical for most regions of the Central American Waters. An exception is along the Gulf Coast of the United States where four distinct seasons associated with the middle latitudes prevail. Intermonthly precipitation averages differ little throughout the Gulf Coast region. A small maximum is noted in July and a minimum in October. For the large remaining portion of the study area, basically only wet and dry seasons are discernible. The wet season normally runs from May through November with the dry season covering the remaining months. Since the sun's position changes little in the tropics the temperature cycle is typically stable with little annual variation. Since expected temperatures are of little concern, the important question is whether the rains will come as expected, for they spell success or failure of the crops. Normal rainfall depends on the major circulation patterns coming into play as the North Atlantic subtropical high builds during the summer season. With its development, easterly winds become stronger aloft transporting increased moisture necessary for the seasonal rains. Orographic effects play an increasingly important role along with convergence and surface heating, as any one of these can trigger the instability necessary for producing rain showers and thunderstorms. As the North Atlantic subtropical high weakens during the winter (see Fig. 5) the westerlies again dominate the flow aloft, cut off the moist easterly flow, and thus bring on the dry season.

A large differential in mean precipitation was noted within a distance of less than 20 nautical miles, and from an increase in elevation of less than 30 feet on the Yucatan Peninsula. Progreso, on the coast, averaged 16.69 inches per year (1941-1970 normals) and Merida averaged 37.67 inches for the same period. The differential for the 1961-70 decade was even greater at a ratio of three to one at 13.11 inches versus 38.16 inches. Based on station proximity and similar topography the data would seem to be in error and, in fact, many mean annual precipitation maps do not indicate this differential. Sea surface temperature analyses show cooler sea temperatures along the north coast of the peninsula which tend to inhibit convective activity along the near shore. However, areas slightly inland experience surface heating sufficient to trigger convective showers. In support of this, further investigation showed that while the mean monthly temperatures vary less than 1°F the mean daily maximum temperatures averaged 5°F higher at Merida than Progreso.

Occasionally outbreaks of cold continental air from North America will push into the Gulf of Mexico and Caribbean during the height of the dry season (December through March) bringing precipitation mainly to the coastlines and windward slopes. These cool surges of air are referred to as "northers" and generally bring stronger-than-normal winds and below-normal temperatures as far south as Panama and the southern Caribbean. Northers are modified rather quickly by the tropical environment, thus they affect an area for only one to two days.

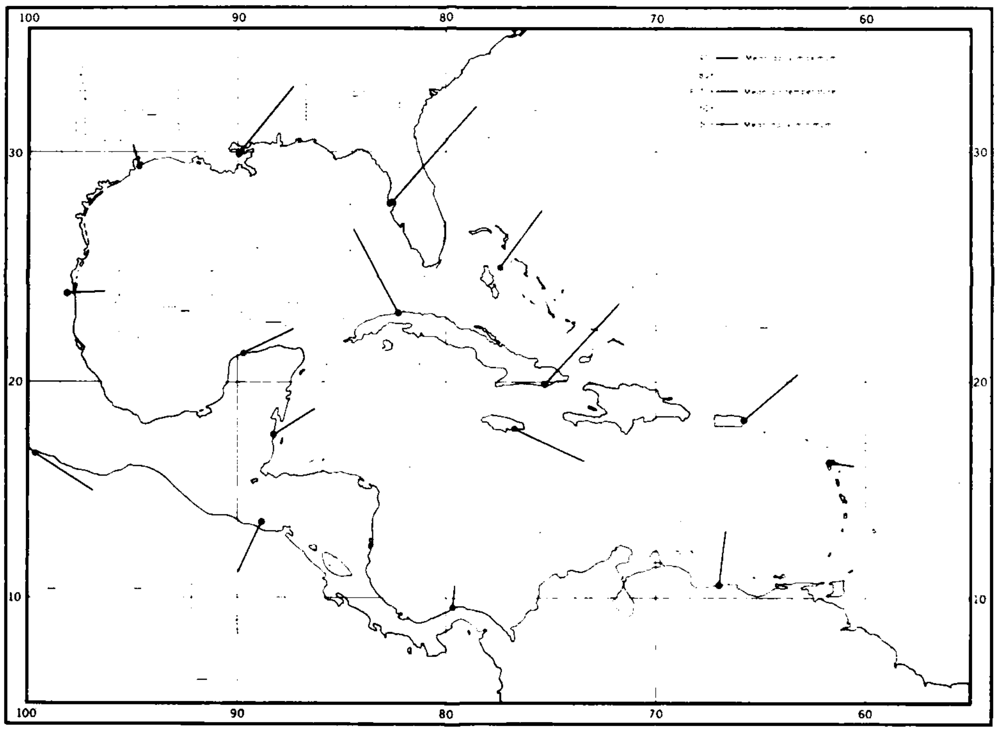


FIG. 8 MONTHLY MEANS OF AIR TEMPERATURE AND RAINFALL

Latitude and maritime influences minimize the temperature variations and keep the annual temperature range relatively small. This can be seen in Figure 8 where monthly means of air temperature and rainfall for selected stations are presented. Mean annual temperature ranges are greatest at the higher latitudes, averaging 25°F-30°F along the Gulf Coast of the U.S. and 10°F or less for most regions south of 20°N. Exceptions south of 20°N are found at some of the higher peaks and across most of Mexico north of 16°N and west of 92°W, except for along the Pacific Coast. Diurnal temperature ranges within the tropics are much greater than the monthly mean temperature differences between the warmest and coldest months. Cloudiness is an important factor because it restricts the afternoon maximum temperatures during the rainy season, whereas, the lack of cloud cover during the dry season permits more nighttime cooling resulting in lower minimum temperatures. Northern Mexico and the southern coastal plains of the U.S. experience wintertime mean temperatures of 55°F to 60°F with average summer temperatures increasing to 80°F to 85°F. These summer values are similar in magnitude to those reported in the lower latitudes where seasonal variations are small. The mean freezing level over the Caribbean remains fairly constant throughout the year at 15,000 to 16,000 feet. While freezing level heights remain at these levels over the southern U.S. during the summer, they drop to near 12,000 feet during the winter. Annual variations in the mean tropopause height are also small, averaging 45,000 to 50,000 feet across the entire study area.

Tropical cyclones are the most feared and devastating weather phenomena of the regions. Frequencies of these storms vary widely among years. For the period 1871 through 1984, for which there are reasonably good records in the North Atlantic, the least activity occurred in 1890 and 1914 when only one tropical storm was reported. The most active years were 1933 when 21 tropical cyclones reached tropical storm strength (34 knots or greater) and 1969 when 12 reached hurricane strength (64 knots or greater). In the North Atlantic Basin, the main tropical cyclone season runs from August through October with significant occurrences in June, July, and November. April is the only month in which no tropical cyclone has ever been reported within the North Atlantic basin.

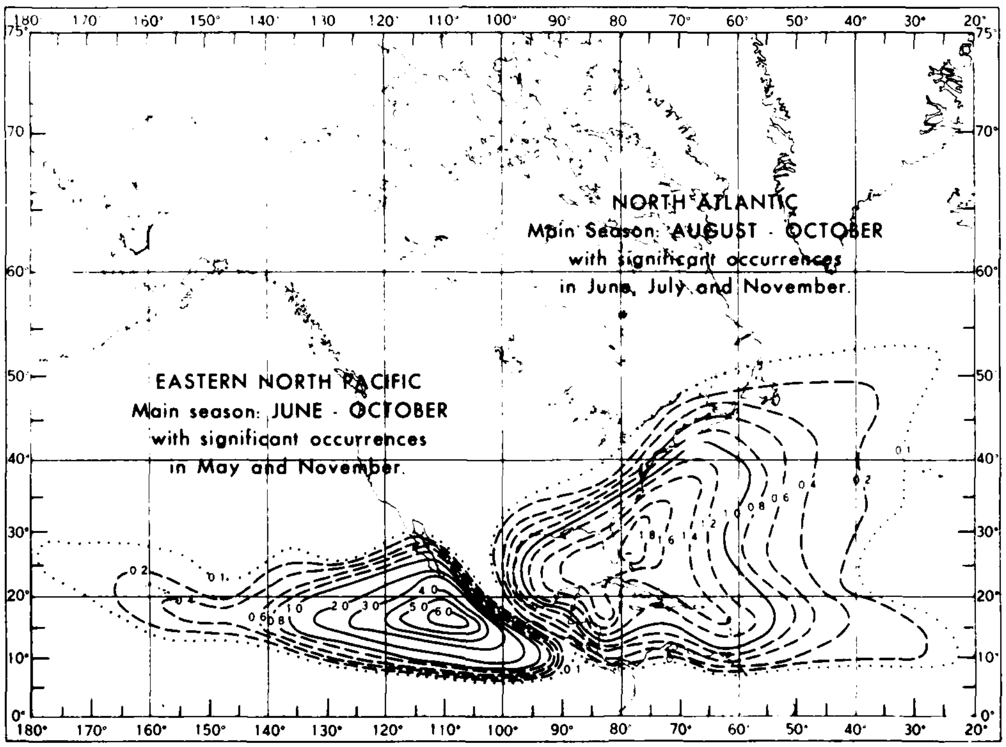


FIG. 9 AVERAGE NUMBER OF TROPICAL CYCLONES PER 5° SQUARE PER YEAR

Highest annual occurrences by five-degree square are found in the eastern North Pacific where the main season is from June through October with significant occurrences in May and November. Fortunately most of these storms track west-to-northwestward out to sea with few affecting Central America. The average number of tropical cyclones per five-degree square per year is given in Figure 9 and the annual 12-hourly movements by five-degree square of tropical cyclone centers with tropical storm intensity or greater are shown in Figure 10. Both figures were adapted from Crutcher and Quayle (1974), a major work produced for the U.S. Navy which presents frequencies and preferred tracks for worldwide tropical cyclones.

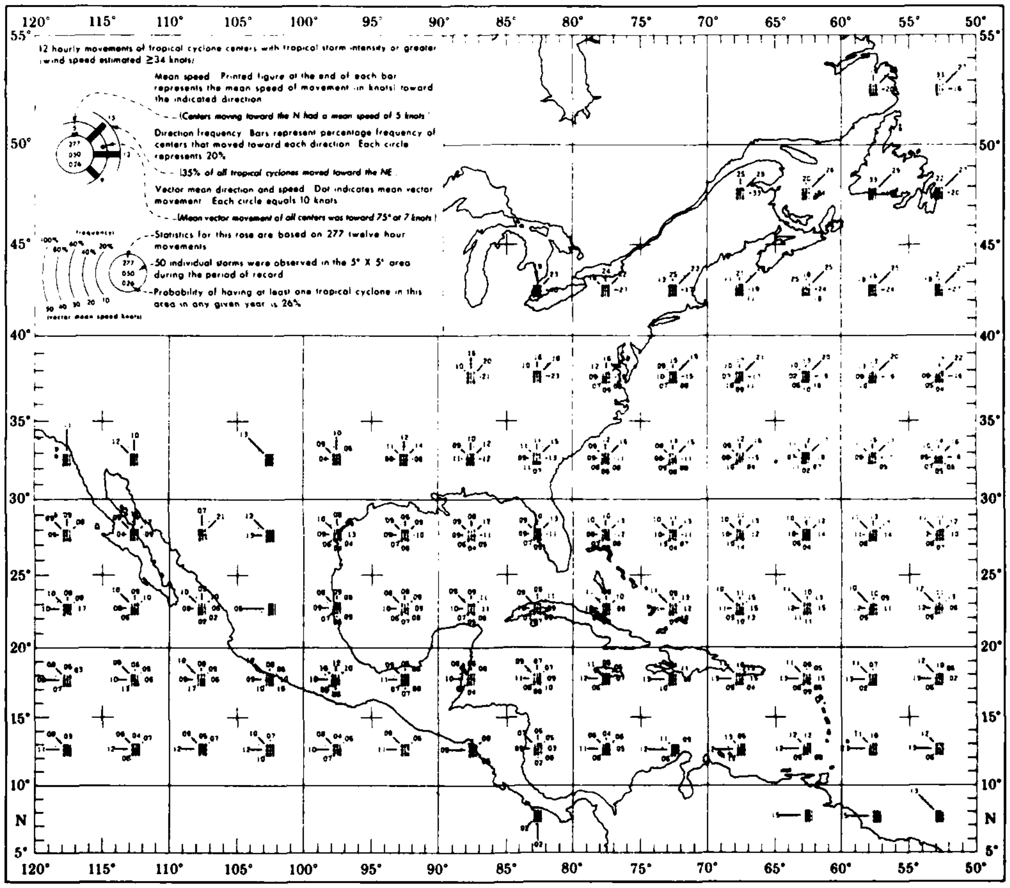


FIG. 10 ANNUAL 12 HOURLY MOVEMENTS OF TROPICAL CYCLONE CENTERS WITH TROPICAL STORM INTENSITY OR GREATER

Marine Climatological Elements

Precipitation

Of the elements recorded in the marine data base, precipitation is one most subject to error in both the way it is observed and the way it is interpreted. In many areas of the world, especially in more recent years, ships try to avoid foul weather and thus bias the data towards fair weather.

Present weather observations reporting precipitation within Region 1 typically reach a percent frequency maximum during the summer months and a corresponding minimum during the winter. This is the same pattern that was previously discussed pertaining to land station data. March brings the lowest percent frequency of precipitation with frequencies from the Yucatan Channel to the Panama Canal averaging only one to two percent. South of the Gulf of Panama, frequencies increase to more than five percent as the area is influenced by the northern edge of the ITCZ. By June, frequencies are still near two percent in the vicinity of the Yucatan Channel but have increased to over 18 percent in the Gulf of Los Mosquitos. On the Pacific Ocean side frequencies increase to over 20 percent as the ITCZ becomes centered over southern Central America. By September, frequencies across the western Caribbean have increased to five percent or higher for most areas while in the Pacific frequencies have begun to decrease. General decreases are noted for most areas in the following months until the ebb is again reached in March.

Assessing oceanic rain is a major problem because transit ships are unable to take quantitative precipitation measurements. A number of studies have been conducted in efforts to predict precipitation amounts or rates of fall based on estimates derived from the use of present weather observations from ships of opportunity (Goroch, et al., 1984) and readings from satellites (Rao, et al., 1976).

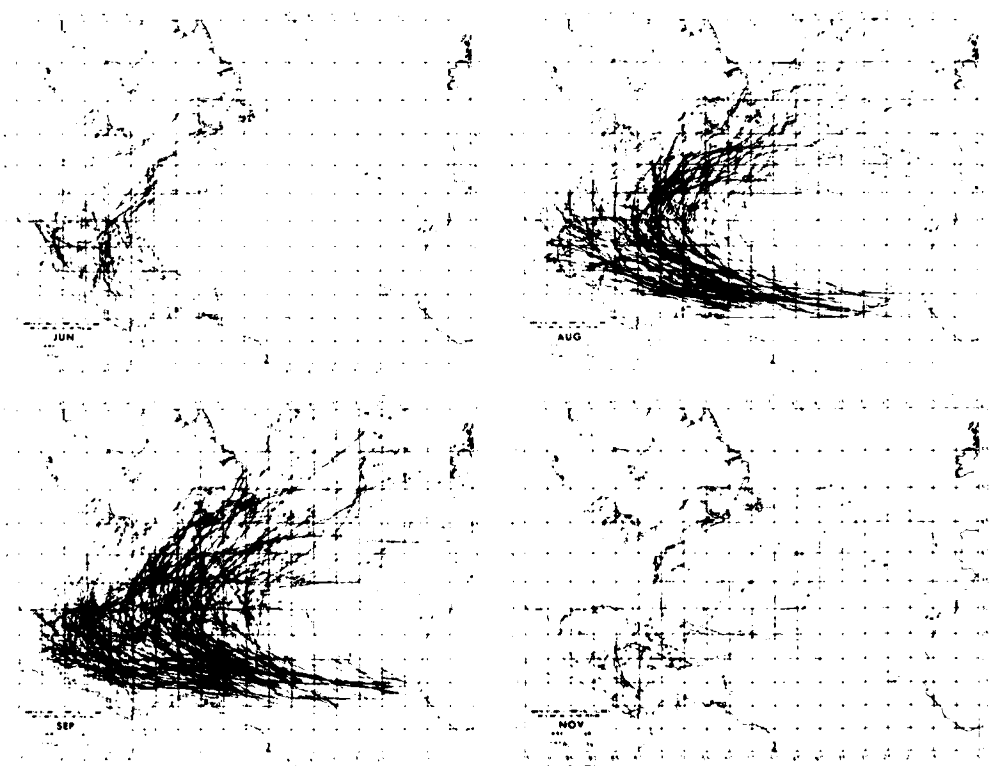


FIG. 11 TROPICAL CYCLONE TRACKS (JUN, AUG, SEP, AND NOV)

Tropical Cyclones

Typically, most tropical cyclone development during the early part of the hurricane season (May and June) occurs in the western Atlantic (Caribbean Sea and Gulf of Mexico). Later in the season (July through September) more development occurs in the central and eastern sections with the seasonal finale (October and November) distribution being more evenly divided between the eastern and western halves of the tropical Atlantic. To illustrate how storm development shifts with the season, tropical cyclone tracks for storms originating in June, August, September, and November (1886-1980) are presented in Figure 11.

By referring back to Figure 10, inference can be made on preferred tracks for the region along with the annual probabilities of encountering a storm. From Figure 9 it is apparent that south of the Panama Canal, the chances of encountering a tropical storm between the equator and 10°N are extremely small; however, operations northwestward along Central America would enter the region with highest concentration of tropical cyclones worldwide.

Air Temperature

Air temperature is one of the most frequently observed elements by mariners. Due to instrument exposure on many ships, the heating effect of the ship's structure has a tendency to produce higher than actual ambient air temperature readings. This is especially true in the tropics where sunny, calm days are numerous. For this study area the problem is somewhat tempered by the wet season and the strong trade winds.

During the winter season, the mean air temperature isotherm pattern over Region 1 takes on some zonal characteristics especially over the Gulf of Mexico and Yucatan Basin. Mean temperatures range from 71°F at 25°N o over 80°F in the Pacific along the southwest coast of Panama. By June, the mean temperature pattern is nearly isothermal over the region as means range from 80°F to 83°F. Late summer shows a reversal in the temperature gradient from that of winter, with warmer means (near 84°F) found in the higher latitudes. The range of mean temperatures remains low (approximately 5°F) with the coolest temperatures appearing over the Pacific equatorial region. A slow transition over the next several months returns the temperature cycle back to its wintertime regime.

Sea Surface Temperature

Sea surface temperatures are recorded with a fairly high frequency in marine observations. The principle methods for sampling are intake thermometers and buckets. Even though the two methods can produce slightly different results, the data may be used with considerable confidence.

A number of mean sea surface temperature isotherm patterns can be delineated within the Central American Waters, two of which are directly correlated with the Gulf Loop Current and Gulf Stream. As distinct as these patterns are during the winter, the Gulf Loop pattern disappears completely during the summer along with a significant weakening in the Gulf Stream pattern. During the winter, a relatively strong sea surface temperature gradient appears over the Gulf of Mexico while a rather weak one is seen over the western Caribbean. Mean sea surface temperatures during this time range from near 75°F at 25°N, to over 82°F along the southwest coast of Panama. From July through September a weak zonal pattern is established with means ranging from a low of 81°F over the Pacific to a high of 84°F in the Gulf of Mexico. By October, signs of the Gulf Loop Current reappear and the reversal of the mean sea surface temperature gradient back to the winter pattern (cooler temperatures at higher latitudes) begins to take place.

Surface Winds

Surface wind is one of the most commonly observed elements. Many of the observations from the NCDC data base are visual observations based on the roughness of the sea. In recent years more ships acquired anemometers and reported measured winds. Prior to 1963 many of the wind speeds were recorded in the Beaufort scale; such estimates have proven to be quite reliable and can be used with a high degree of confidence. Five sets of wind speed isopleths are presented: mean scalar speed, the percent frequency of winds less than 11 knots, 11 to 21 knots, 22 to 33 knots, and greater than or equal to 34 knots. Also included are wind roses by one-degree square.

Throughout the year the northeasterly trades maintain good strength and constancy across the Caribbean Sea (reference Fig. 5). Mean wind speeds average near 20 knots in the vicinity of the Colombian Basin from December through July with the exception of May. They weaken significantly from September through November with mean speeds dropping below 14 knots over the Colombian Basin during October. The weakest scalar mean winds within Region 1 are observed over the Pacific south of Costa Rica where monthly means fall below five knots in late winter. Northern sections of the region (Yucatan Channel and southern Gulf of Mexico) observe mean wind speeds of 12 to 14 knots during the winter and 8 to 10 knots during the summer.

Gale force winds (≥34 knots) reach five percent frequency over the Colombian Basin during January but average less than one percent for all other areas within Region 1. At the peak of the hurricane season, gale force occurrences drop to less than one percent everywhere as the contribution from tropical cyclones is not sufficient to offset the drop in strength of the surface trades.

Wind speeds of less than 11 knots are observed during the winter to occur less than 10 percent of the time over the Colombian Basin and over 90 percent of the time in the Pacific south of the border region between Costa Rica and Panama. Summer pecentages change slightly to 20 and 80 percent, respectively.

Changing wind speed threshold values does not alter the wind speed patterns as stronger winds still observed near the Colombian Basin and the weakest ones south of the Peninsula de Osa in the Pacific. Monthly mean wind speeds of 11 to 21 knots are reported 50 to 60 percent of the time between Jamaica and Colombia and less than 10 to 20 percent off the Peninsula de Osa. Ninety percent of the observations taken over the Yucatan Basin and southern Gulf of Mexico report wind speeds of less than 22 knots with approximately half this subset reporting wind speeds of less than 11 knots.

Speeds of 22 to 33 knots are observed less frequently during October than any other month as frequencies run less than 10 percent throughout Region 1. Observed frequencies for January are the highest with frequencies averaging over 40 percent for the Colombian Basin and 20 percent along the southern Pacific coast of Nicaragua. Frequencies of less than 10 percent are then observed across the northern Caribbean, southern Gulf of Mexico and the Pacific coast region of Costa Rica and Panama.

Visibility

Visibilities are difficult to measure at sea because of the lack of distance reference points. Climatically, many low visibility observations are probably missed because the observer is too busy with other duties (fair weather bias). However, the coarseness of the visibility code intervals tends to minimize the problem thereby permitting the summarized data to be relatively consistent.

The visibility tables that are presented by one-degree square show that throughout Region 1, observed visibilities average five miles or better 90 percent or more of the time regardless of the month. Although it is difficult to establish a clear trend from the data, subtle shifts emerge during the wet season as observational percentages tend to shift from the ≥ 10 nautical mile category to the lower ≥ 5 but < 10 nautical mile category.

Clouds

A survey of the cloud data (total and low cloud amounts) from the marine data base shows a number of total clouds reports significantly greater than low cloud amounts. This is because many of the early marine observations contain only total cloud amounts. For the two presentations (total cloud amount ≤ 2/8 and low cloud amounts ≥ 5/8) only those observations reporting both total and low cloud amounts were summarized. This helps eliminate problems introduced as a result of different size data bases (N-count). The use of satellite data helps bolster confidence in the total cloud analyses because they show fairly close agreement with those summaries (U. S. Department of Commerce and United States Air Force, 1971).

From December through April, the percent frequencies of low clouds greater than or equal to five oktas generally run 10 to 20 percent across Region 1. By May, frequencies increase to 30 to 50 percent across the southern half of the Caribbean Sea and Pacific coast regions and they remain high until November-December before entering the next phase of the two season cycle.

The seasonal shift in the total cloud amounts is somewhat more apparent than in the low cloud amounts. Total cloud amounts of less than or equal to two oktas basically make up 40 to 50 percent of the observations taken from January through March along the Pacific coast of Central America and the Caribbean coast of Colombia. Remaining regions of the western Caribbean run 25 to 35 percent. May through November percentages generally range from less than 10 percent over the Pacific section of Region 1 to 20 to 30 percent northward from the Yucatan Basin. April and December do not clearly fall into either season as they are basically transition months.

Ceiling and Visibility

Aircraft-type ceilings are not available from marine observations. The ceilings are estimated from the height of the lowest cloud when low clouds cover more than half the sky. When the sky is totally obscured by rain, fog, dust, or other phenomena, the total obscuration is considered a ceiling with a height of zero. Mid-range ceiling and visibility charts (ceiling less than 1,000 feet and/or visibility less than 5 nautical miles; ceiling less than 8,000 feet and/or visibility less than 10 nautical miles) and low range ceiling and visibility charts (ceilings less than 300 feet and/or visibility less than 1 nautical mile; ceiling less than 600 feet and/or visibility less than 2 nautical miles) are presented.

Ceilings less than 8,000 feet and/or visibilities less than 10 nautical miles are at a minimum during the dry season with frequencies averaging 20 to 30 percent. Somewhat lower occurrences are found along the Pacific coast of Central America and higher values along the Pacific coast of South America. During the wet season, frequencies increase to 40 to 50 percent across the southern Caribbean and 60 to 70 percent in the Pacific, west of Colombia.

The next lower threshold (less than 1,000 feet and/or 5 nautical miles) has very similar seasonal patterns. Frequencies during the winter run 5 to 10 percent throughout most of Region 1. Summer averages increase to 20 to 30 percent in the Pacific, south of 10°N, and across the southwest Caribbean Sea.

Conditions rarely deteriorate into the lowest threshold category (less than 300 feet and/or 1 nautical mile) as indicated by only few areas even reporting frequencies as high as one to three percent. For ceilings less than 600 feet and/or visibilities less than two nautical miles frequencies run slightly higher at three to four percent along a few coastal sections from December through March. Frequencies then increase slowly over the next several months reaching 10 to 12 percent in a few areas during October and November.

Wave Heights

Wave heights have been recorded in a consistent quantitative code since only the late 1940's. The reluctance of many observers to take wave observations in the earlier years and the difficulty in estimating waves, especially in confused seas, make wave observations one of the least commonly observed elements. They are also subject to biases. Generally the heights are too low, the periods too short, and the sea-swell discrimination poor (Quayle, 1980). The data in this study have not been adjusted for the suspected biases other than that they were processed through a quality control procedure where an internal check was made between wind speed and sea height. The data were also matrix-arrayed and apparent erroneous outliers were deleted in both the sea and swell data. Wave height presentations include isopleth maps showing percent frequencies of wave heights $\geq$ 3 feet and $\geq$ 8 feet. In addition, wave height tables by one-degree quadrangle show frequencies by six wave height categories. In these presentations, the higher of the sea or swell was selected for summarization. If heights were equal, the wave with the longer period was selected.

For any month or any open ocean location within Region 1 there is better than a 50 percent chance of encountering wave heights of three feet or better. The highest frequencies of three foot or higher waves is over the Colombian Basin where they are observed more than 90 percent of the time for all months except September through November when frequencies drop to 80 percent. Frequencies generally run 20 to 30 percent lower than the Colombian Basin for the coastal regions and 10 to 15 percent lower in the other remaining areas.

Wave regime patterns for wave heights of eight feet or greater are very similar to that of the lower threshold value. Waves eight feet and higher occur least during October when frequencies generally run less than 10 percent except over the Colombian Basin and seaward of the Pacific continental shelf where reports just exceed the 10 percent level. With the exception of the Colombian Basin where frequencies reach 50 percent for eight foot waves or higher on the average during five months, frequencies in other areas rarely exceed 10 percent.

Ocean Currents

The ocean current charts are compiled principally from ship drift reports that were forwarded by the various merchant marines to the Naval Oceanographic Office. From these drift observations, the set (direction) and drift (speed) of the prevailing currents are calculated for each one-degree square. The density of observations is greatest along the major shipping routes and reliability of the current charts is best in these areas. The data are considered most useful when used collectively as in summaries where a large number of observations are available.

Surface current charts displayed for Region 1 of the Central American Waters are Winter (Jan., Feb., Mar.), Spring (Apr., May, Jun.), Summer (Jul., Aug., Sep.) and Autumn (Oct., Nov., Dec.).

Summary

Large variations in the weather are not experienced at scales that exist in the higher latitudes except for the seasonal tropical cyclones. In general, weather conditions are pleasant with small diurnal temperature ranges and small intermonthly temperature variations. This is especially true for the marine areas. Land sites can vary much more depending on elevation, local effects, cloud cover, land and sea breeze, and effects of ocean currents and sea temperatures. In addition to the persistently warm temperatures, high humidities prevail especially over lowlands and ocean areas.

At the lower elevations daily temperatures generally range from nighttime lows in the 60°F's to 70°F's to daytime highs of 80°F's and 90°F's. Temperatures above 10,000 feet will average 10°F to 20°F lower. Below 3,000 feet, extreme temperatures rarely drop below 40°F although they occasionally rise above 100°F.

Hurricanes are certainly the most destructive natural force in the region, and their associated storm surges prove to be the most damaging phenomenon to low-lying coastal areas as they often rise 10 to 15 feet above normal tide level. Flooding and mudslides also prove dangerous with both generally resulting from a passing hurricane.

Although migratory low pressure systems, such as easterly waves and tropical cyclones, strongly influence the weather from time to time, it is the constancy of the trade winds and the high sun angle that establishes the regional climate.

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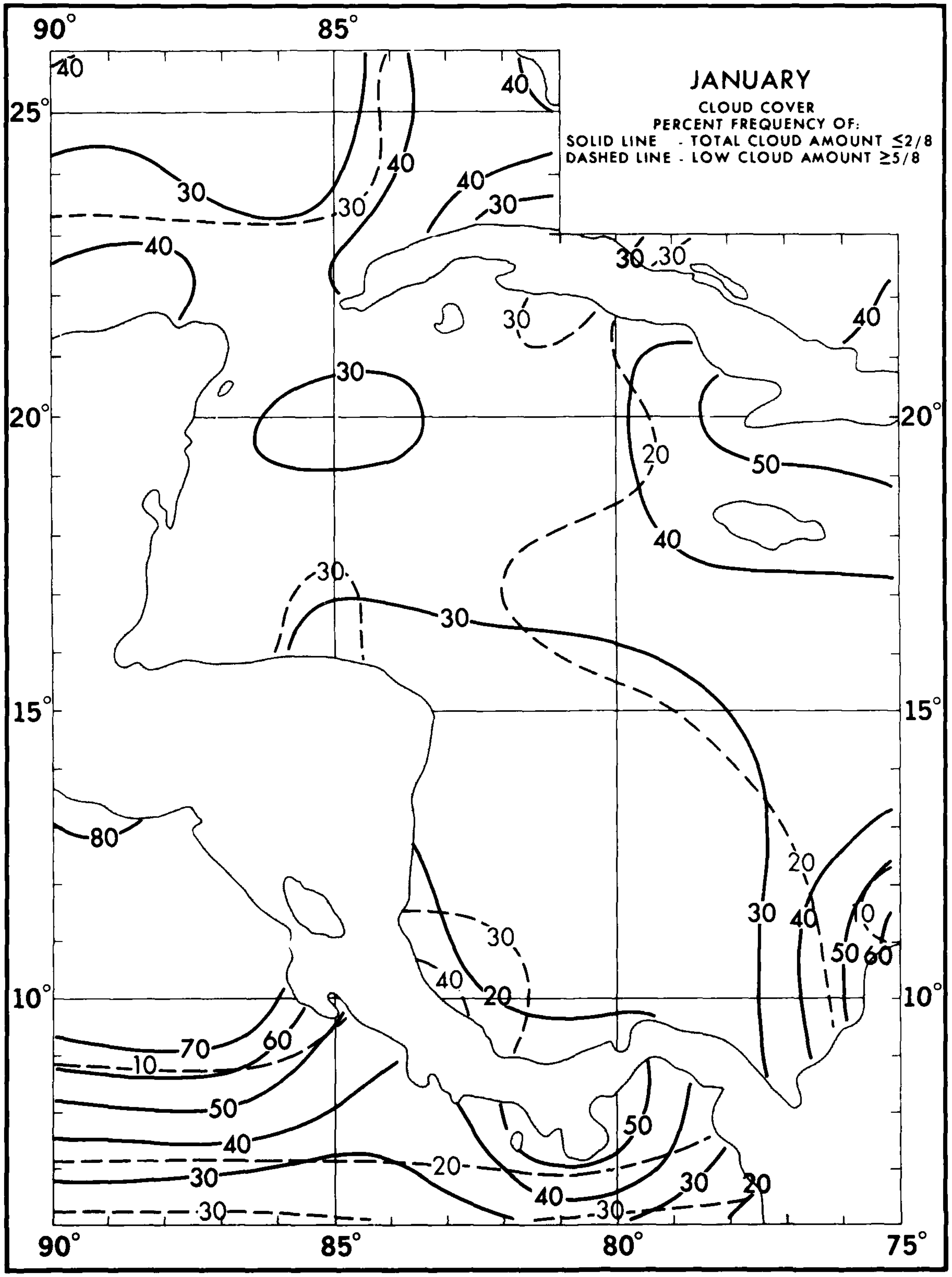
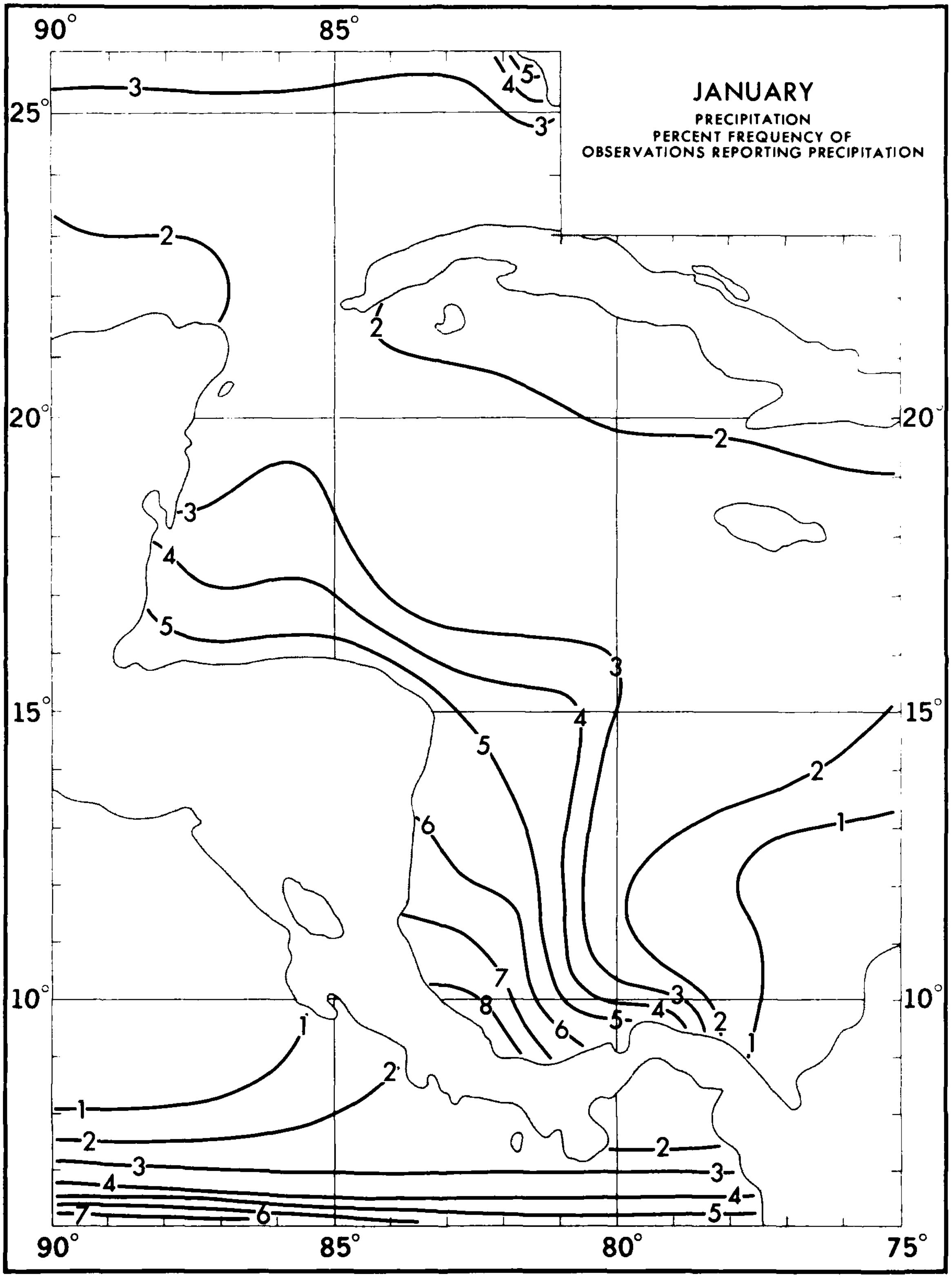
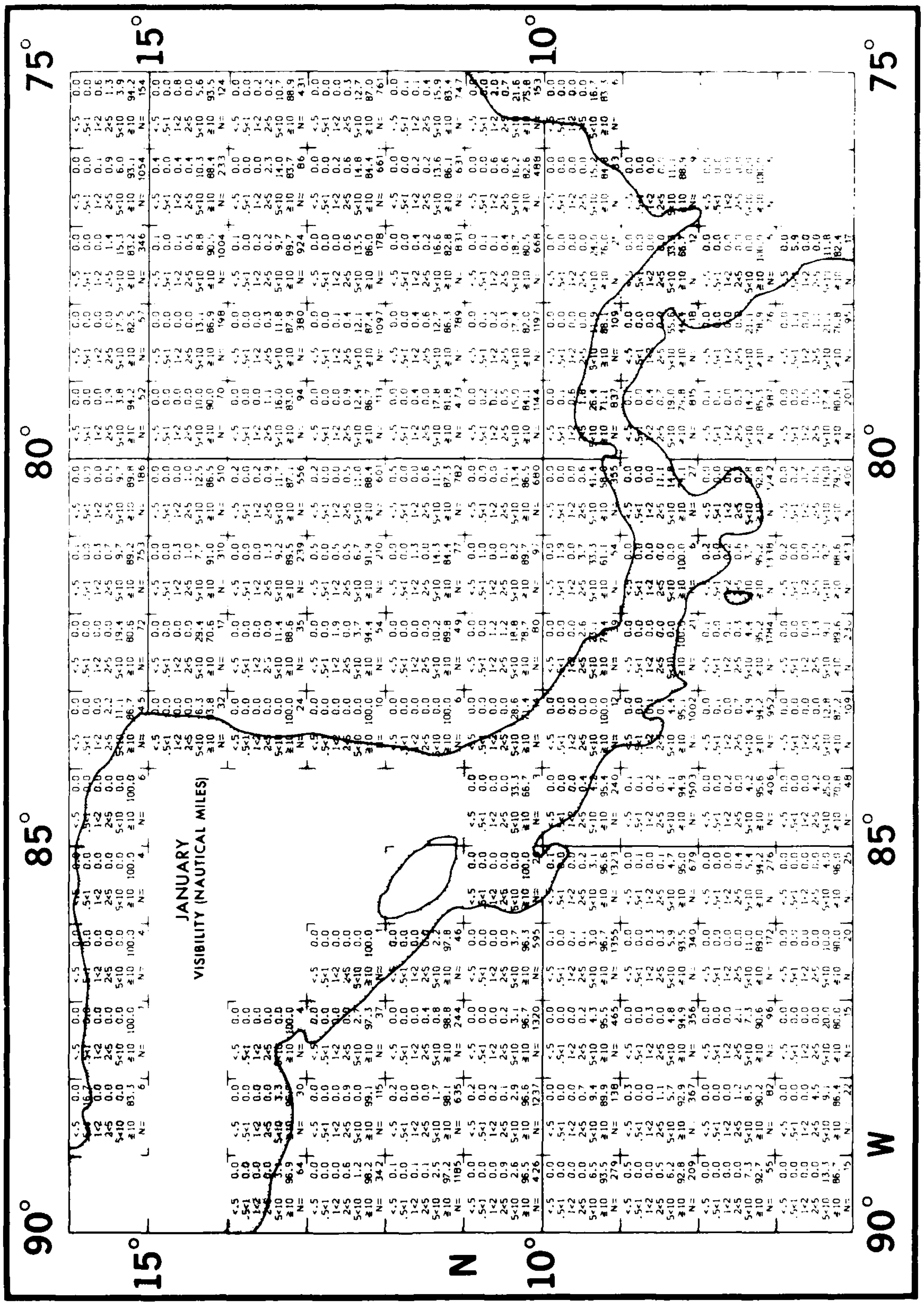
INDEX

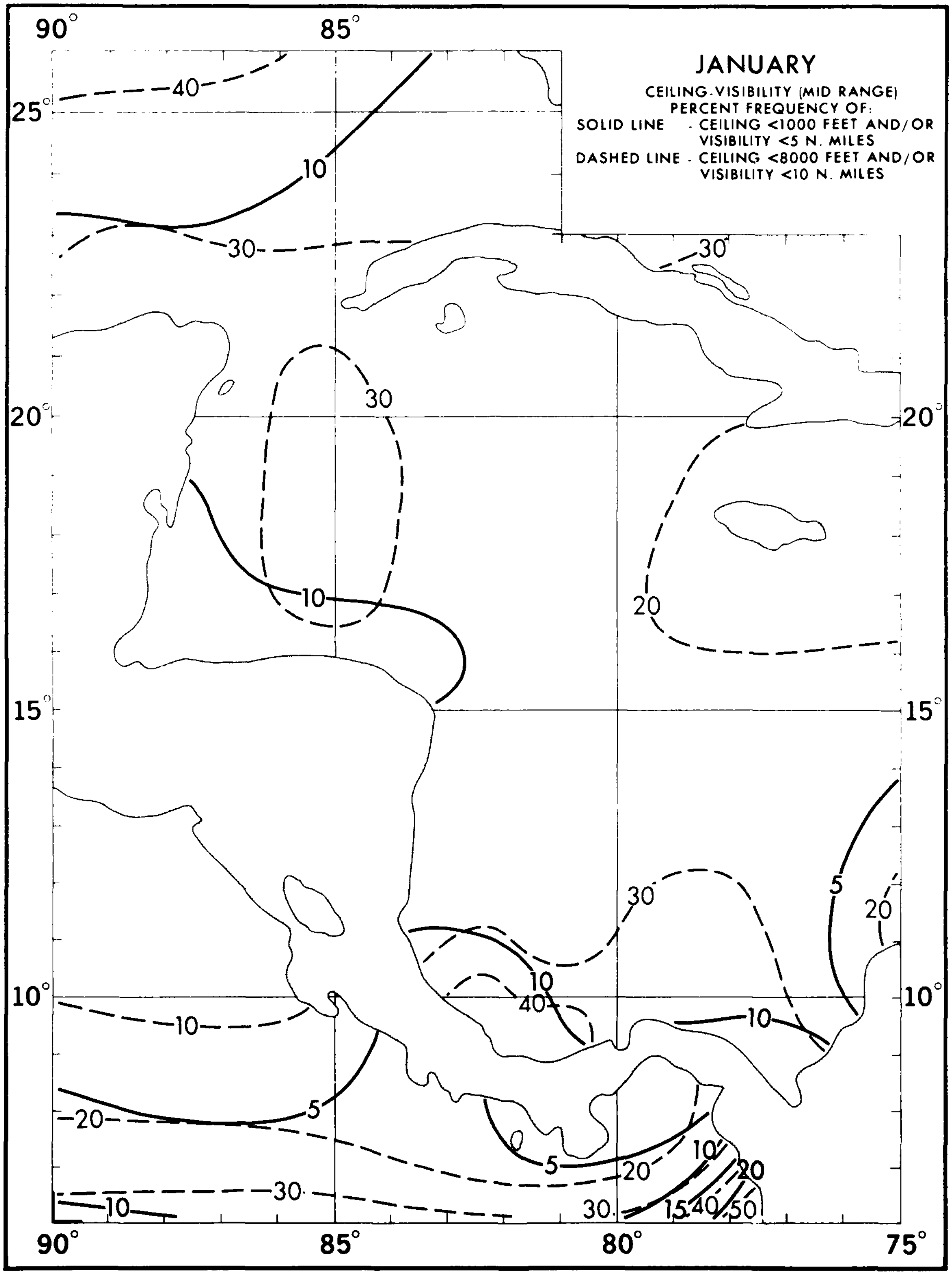
MONTH \ ELEMENT	CLOUDS	PRECIPITATION	VISIBILITY-TABLES	CEILING-VISIBILITY (mid range)	CEILING-VISIBILITY (low range)	WIND-VISIBILITY-CLOUDINESS	SCALAR MEAN WIND SPEED	WIND SPEED <11 and ≥34 knots	WIND SPEED 11-21 and 22-33 knots	SURFACE WIND ROSES	AIR AND SEA TEMPERATURE	WAVE HEIGHT-ISOPLETHS	WAVE HEIGHT-TABLES	SURFACE CURRENTS (seasonal)
JANUARY	2	3	4	6	7	8	9	10	11	12	14	15	16	194 THRU 197
FEBRUARY	18	19	20	22	23	24	25	26	27	28	30	31	32	
MARCH	34	35	36	38	39	40	41	42	43	44	46	47	48	
APRIL	50	51	52	54	55	56	57	58	59	60	62	63	64	
MAY	66	67	68	70	71	72	73	74	75	76	78	79	80	
JUNE	82	83	84	86	87	88	89	90	91	92	94	95	96	
JULY	98	99	100	102	103	104	105	106	107	108	110	111	112	
AUGUST	114	115	116	118	119	120	121	122	123	124	126	127	128	
SEPTEMBER	130	131	132	134	135	136	137	138	139	140	142	143	144	
OCTOBER	146	147	148	150	151	152	153	154	155	156	158	159	160	
NOVEMBER	162	163	164	166	167	168	169	170	171	172	174	175	176	
DECEMBER	178	179	180	182	183	184	185	186	187	188	190	191	192	



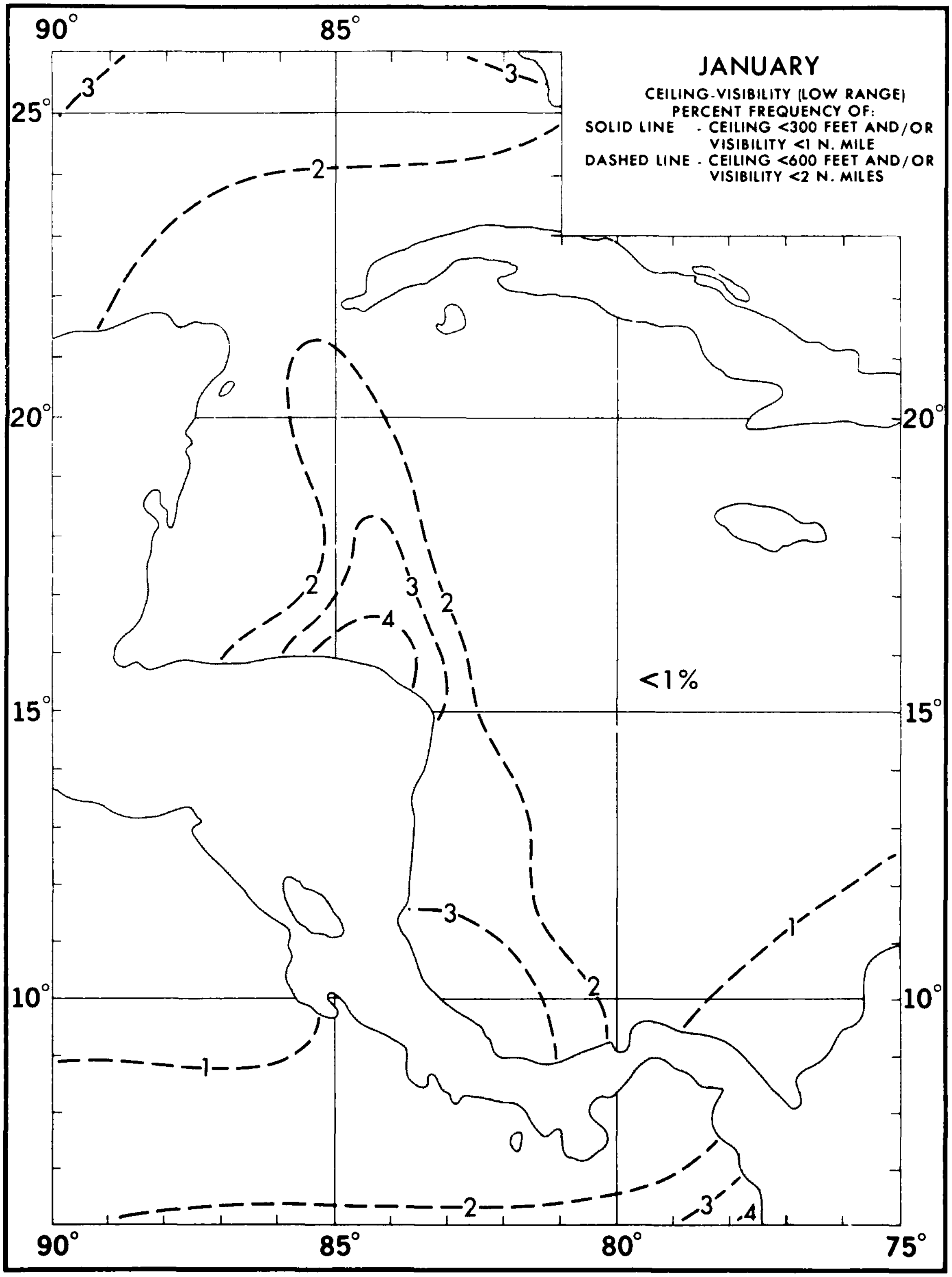
JANUARY
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°

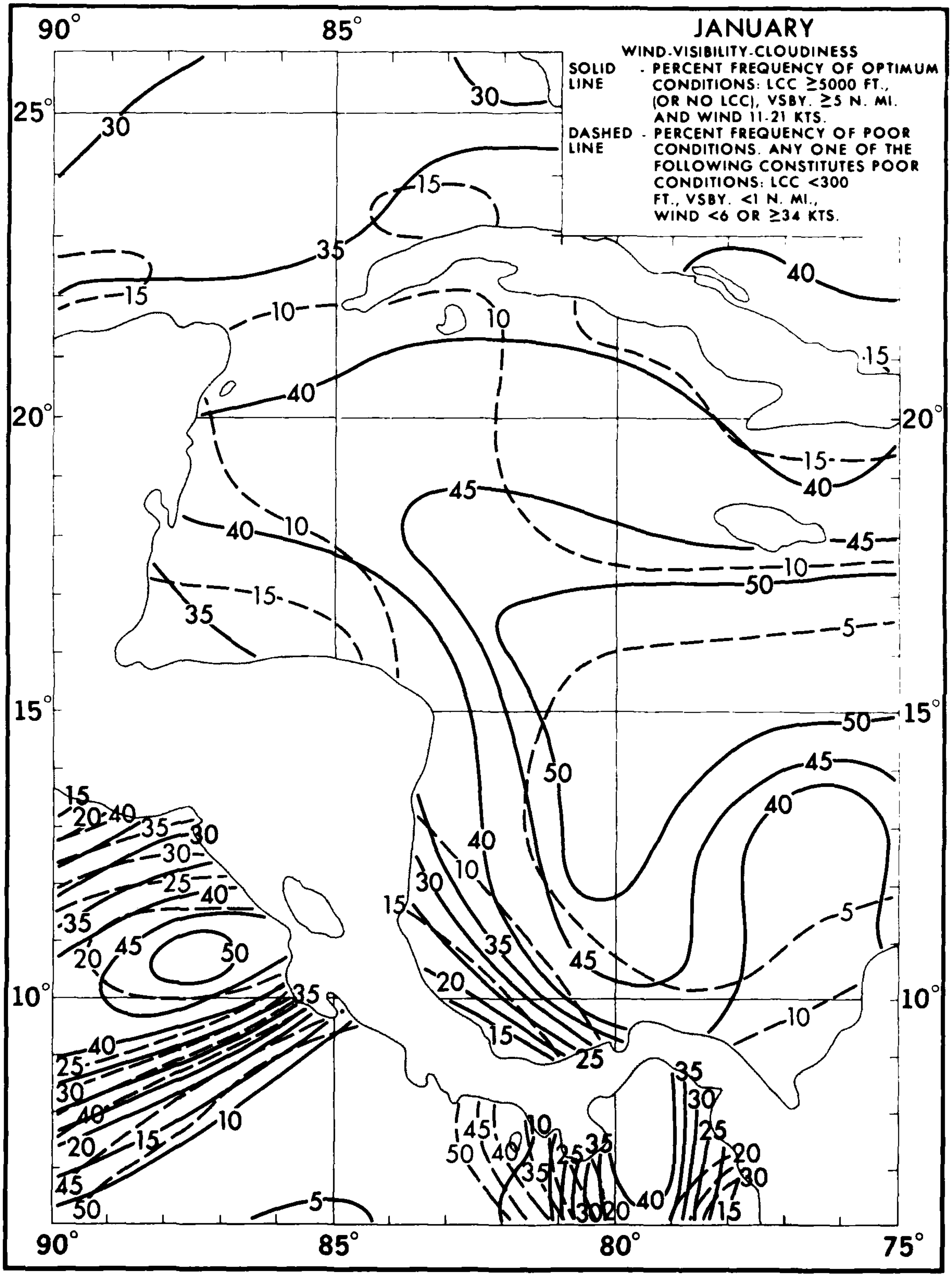

JANUARY
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°

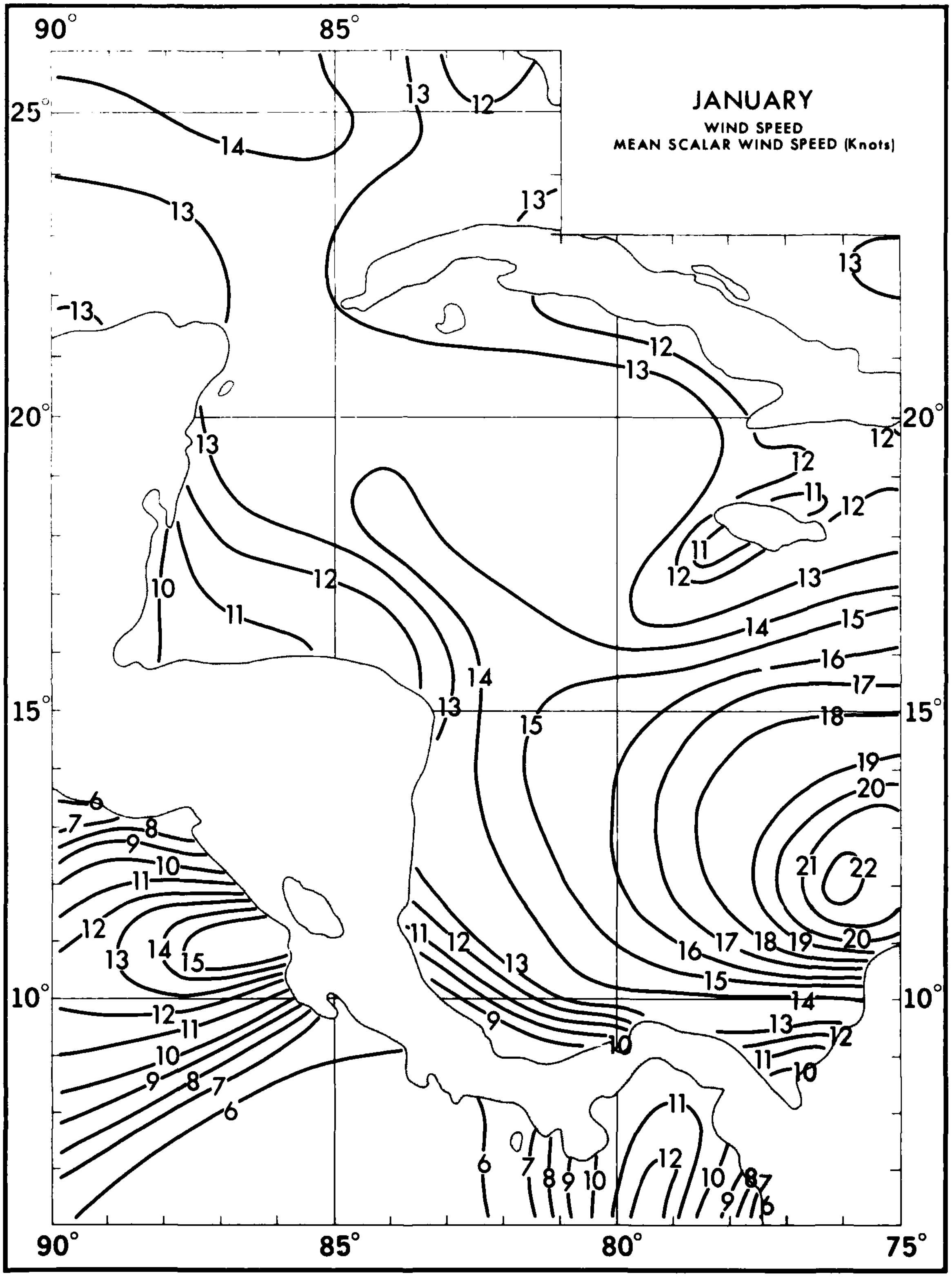

JANUARY
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
10°
N
W

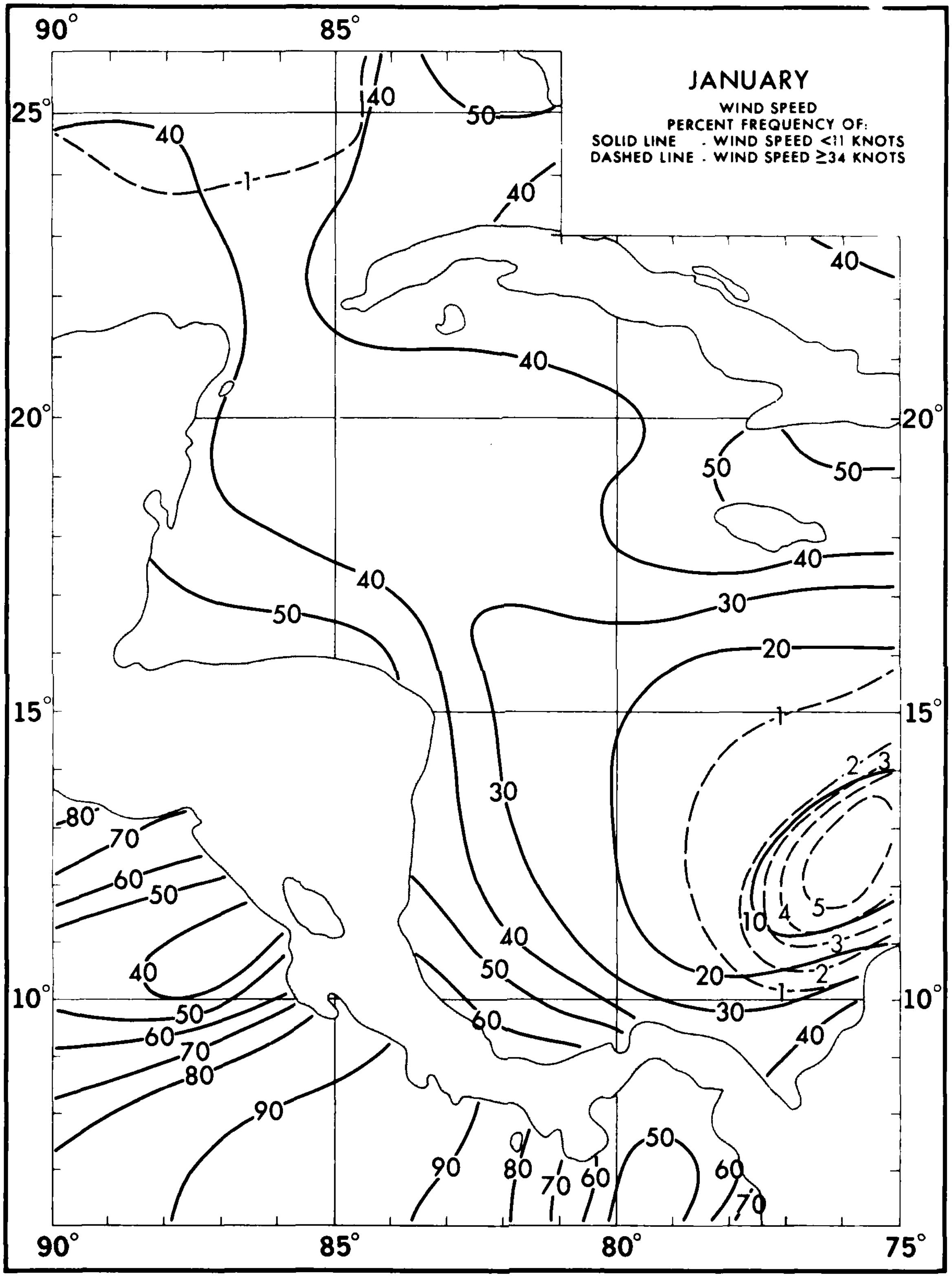


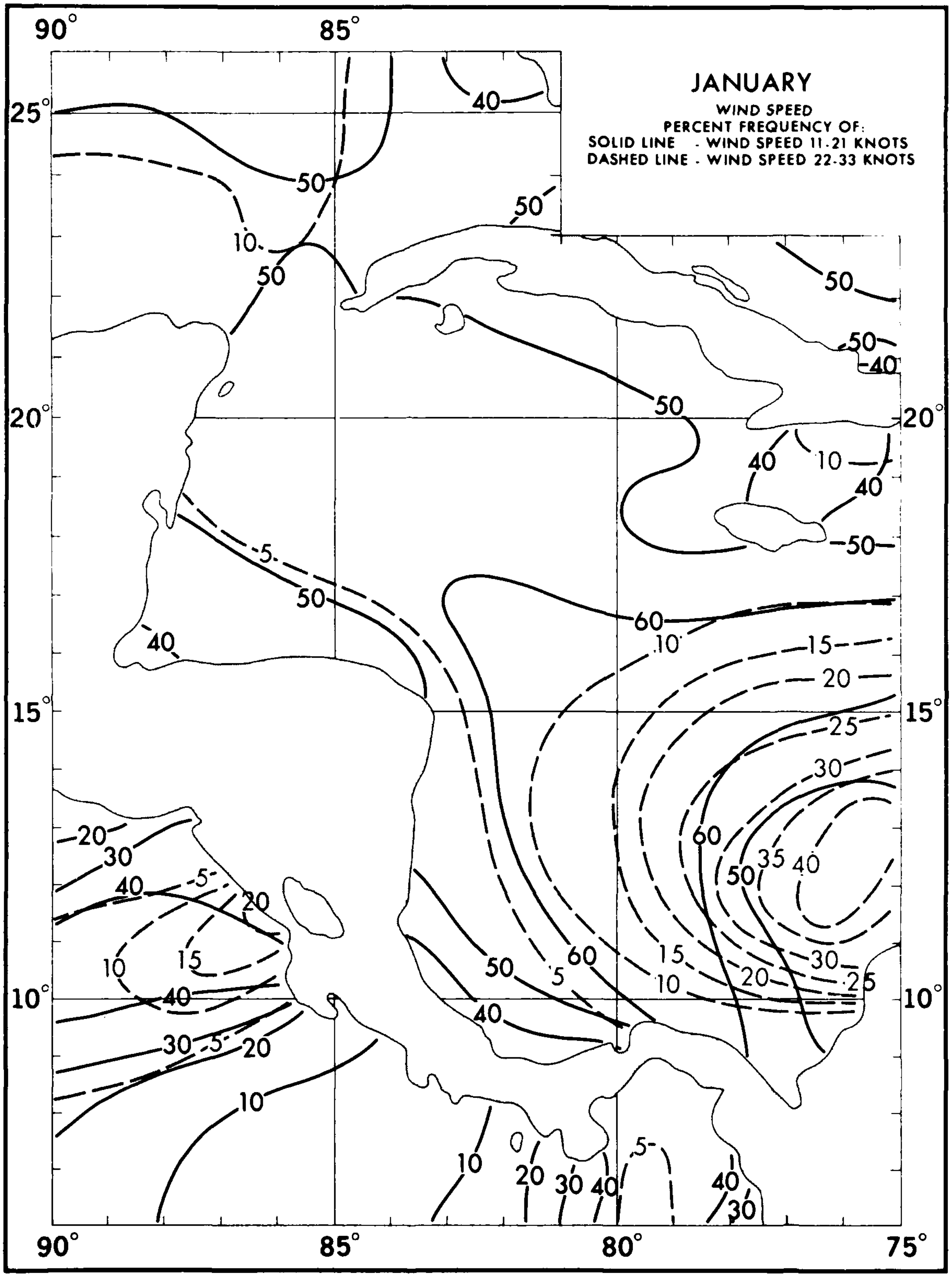
JANUARY
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
40
30
10
20
5
50
15

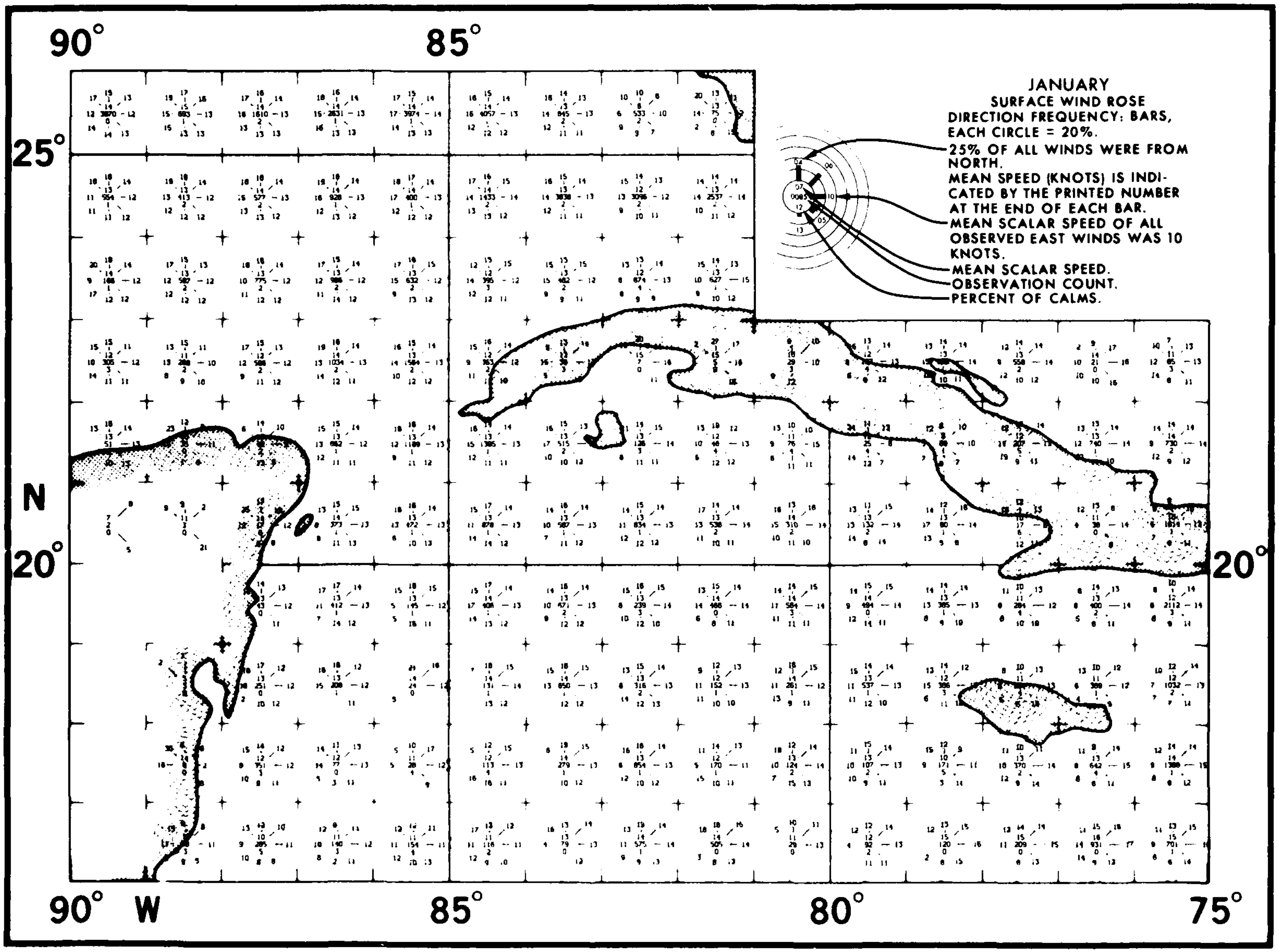

JANUARY
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
<1%
1
2
3
4

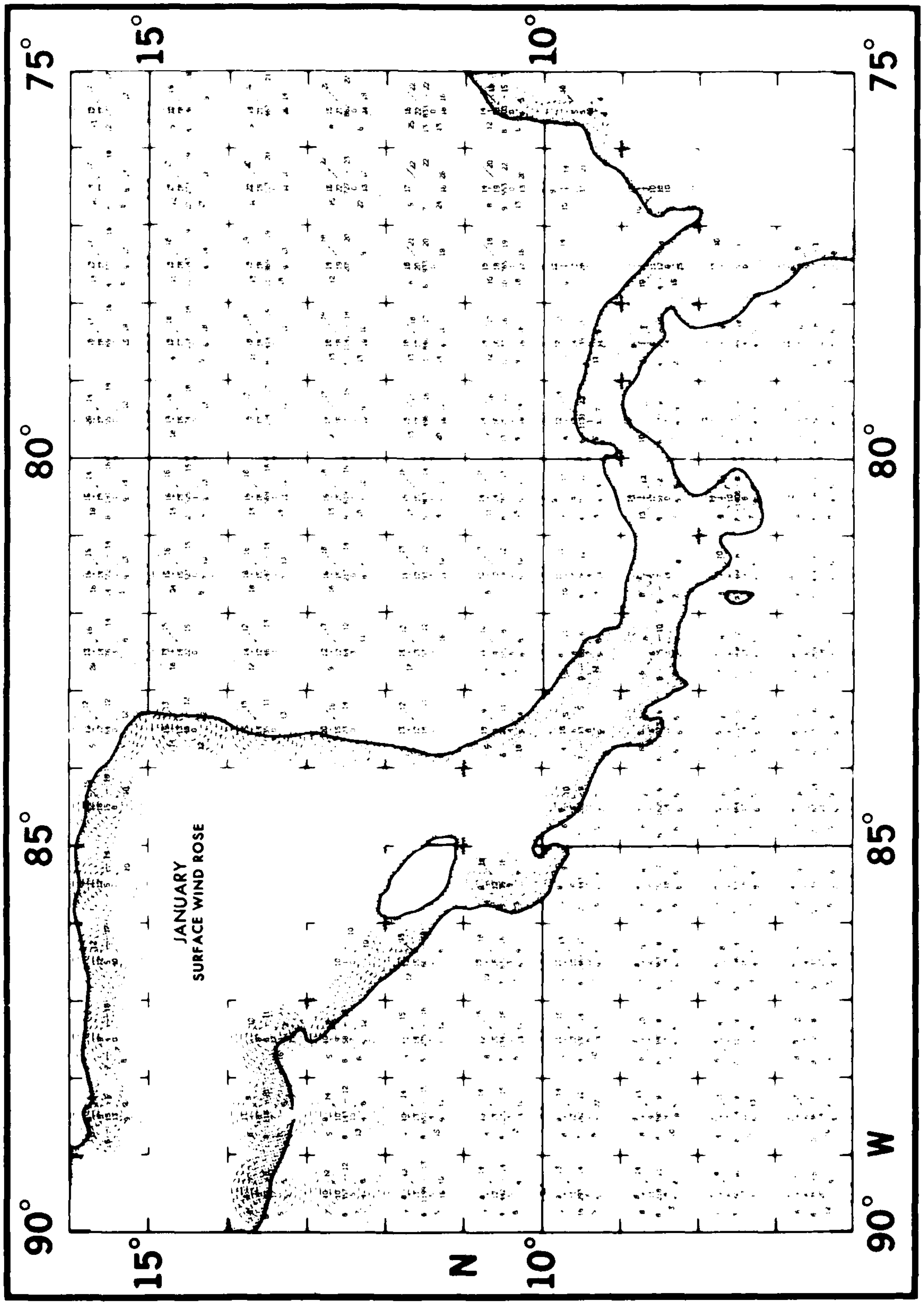

JANUARY
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°

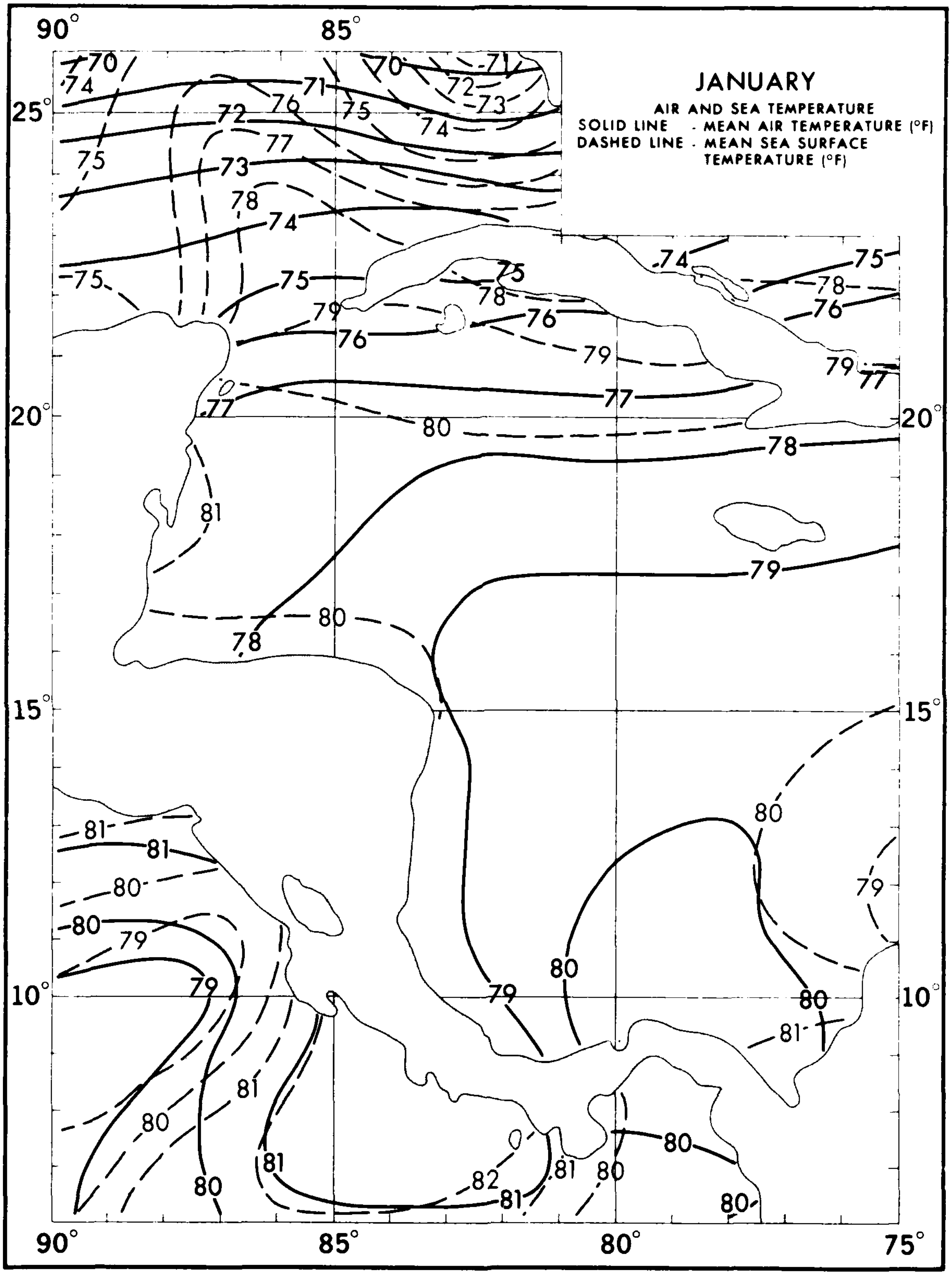

JANUARY
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°


JANUARY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°

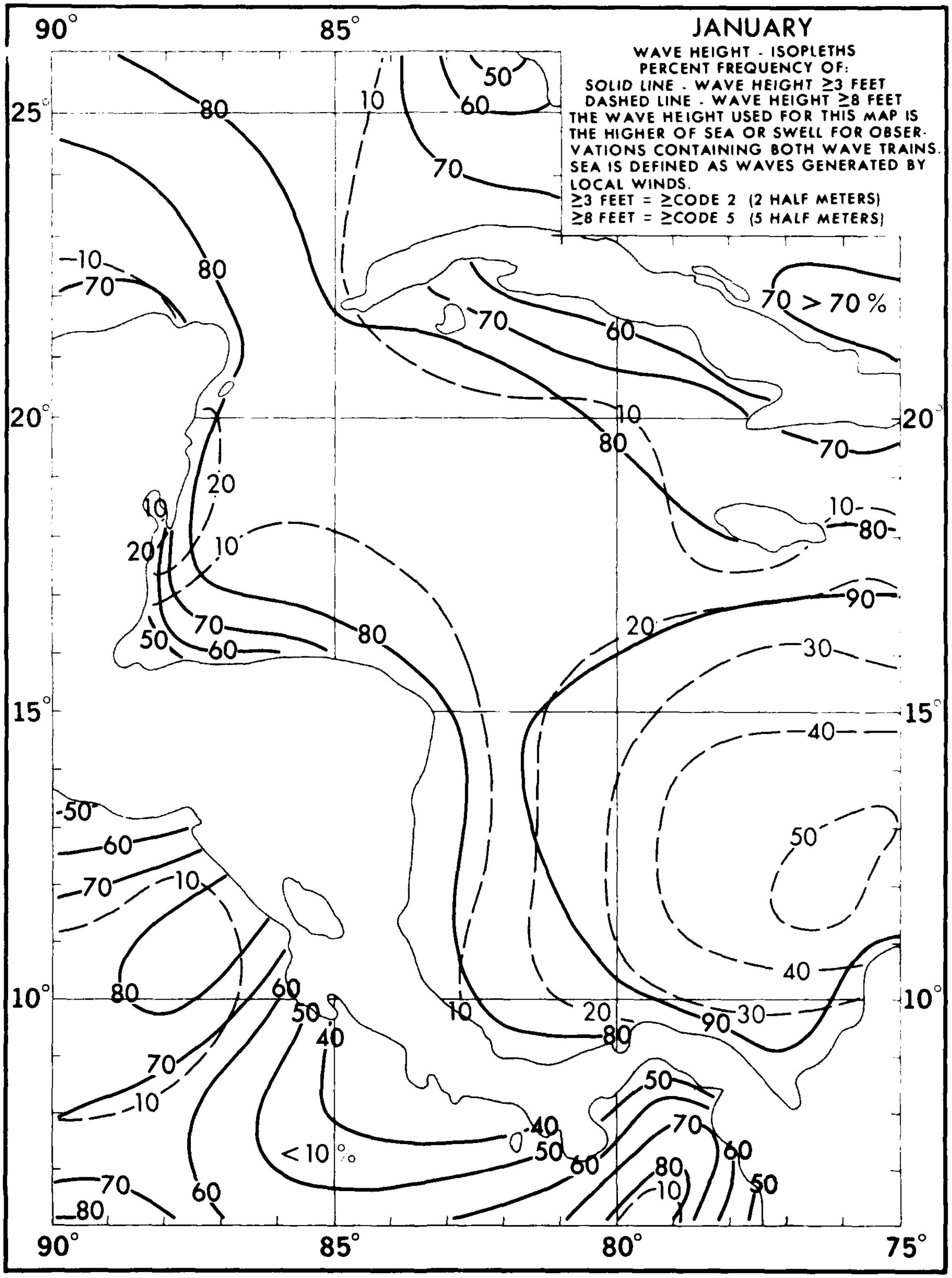

JANUARY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°


JANUARY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
80°
75°
25°
20°
N
W

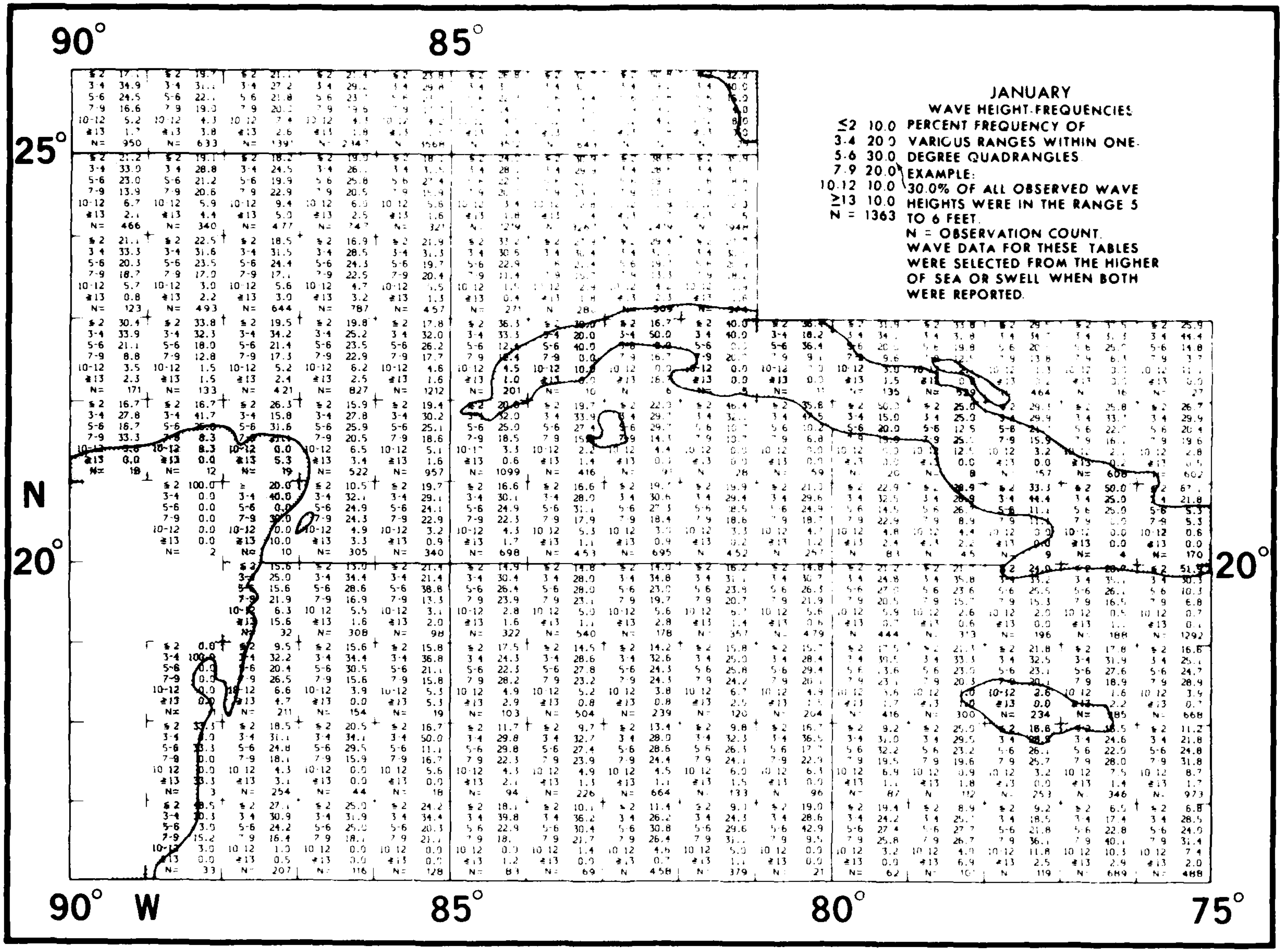

JANUARY
SURFACE WIND ROSE
75°
80°
85°
90°
15°
10°
N
W

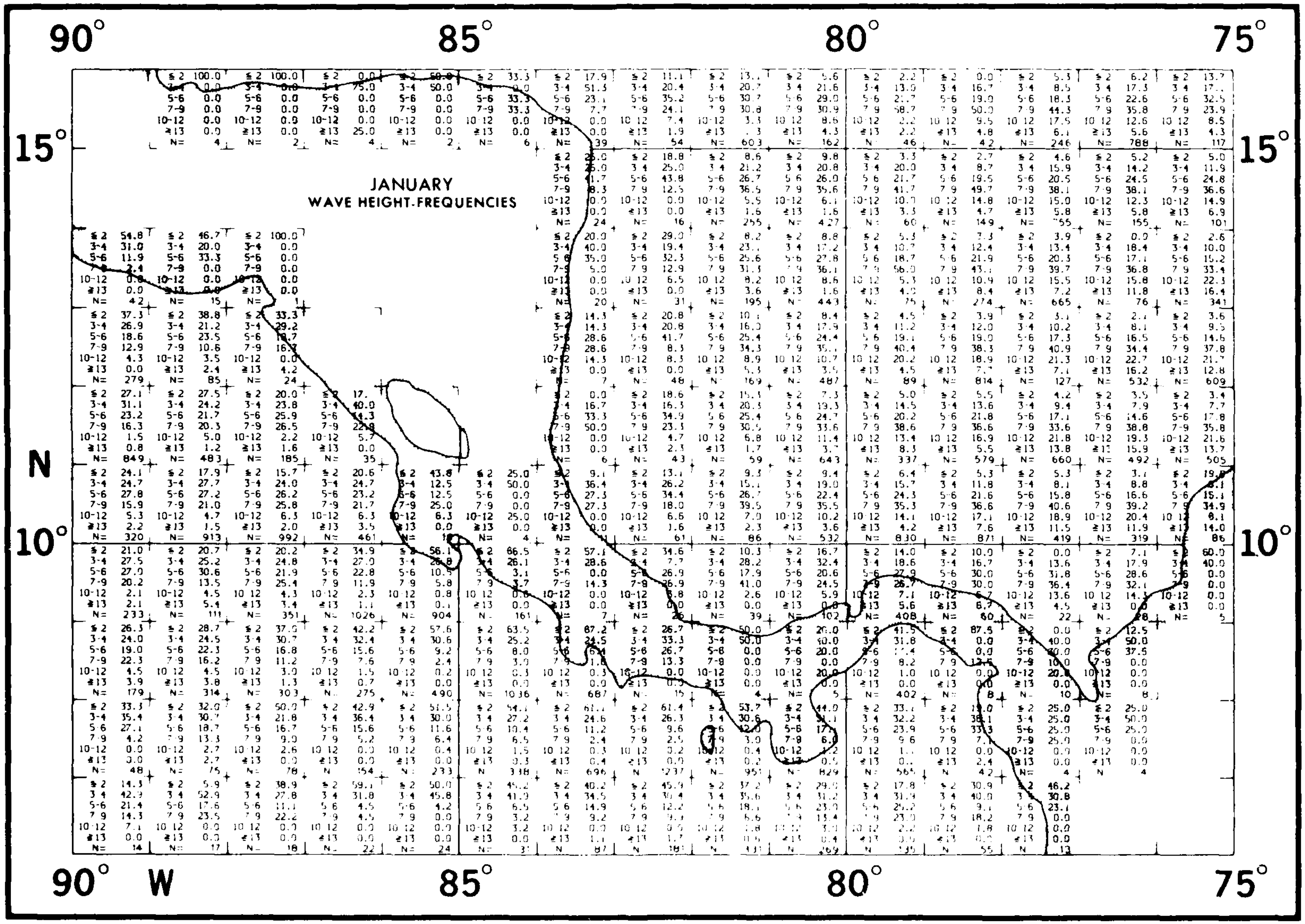


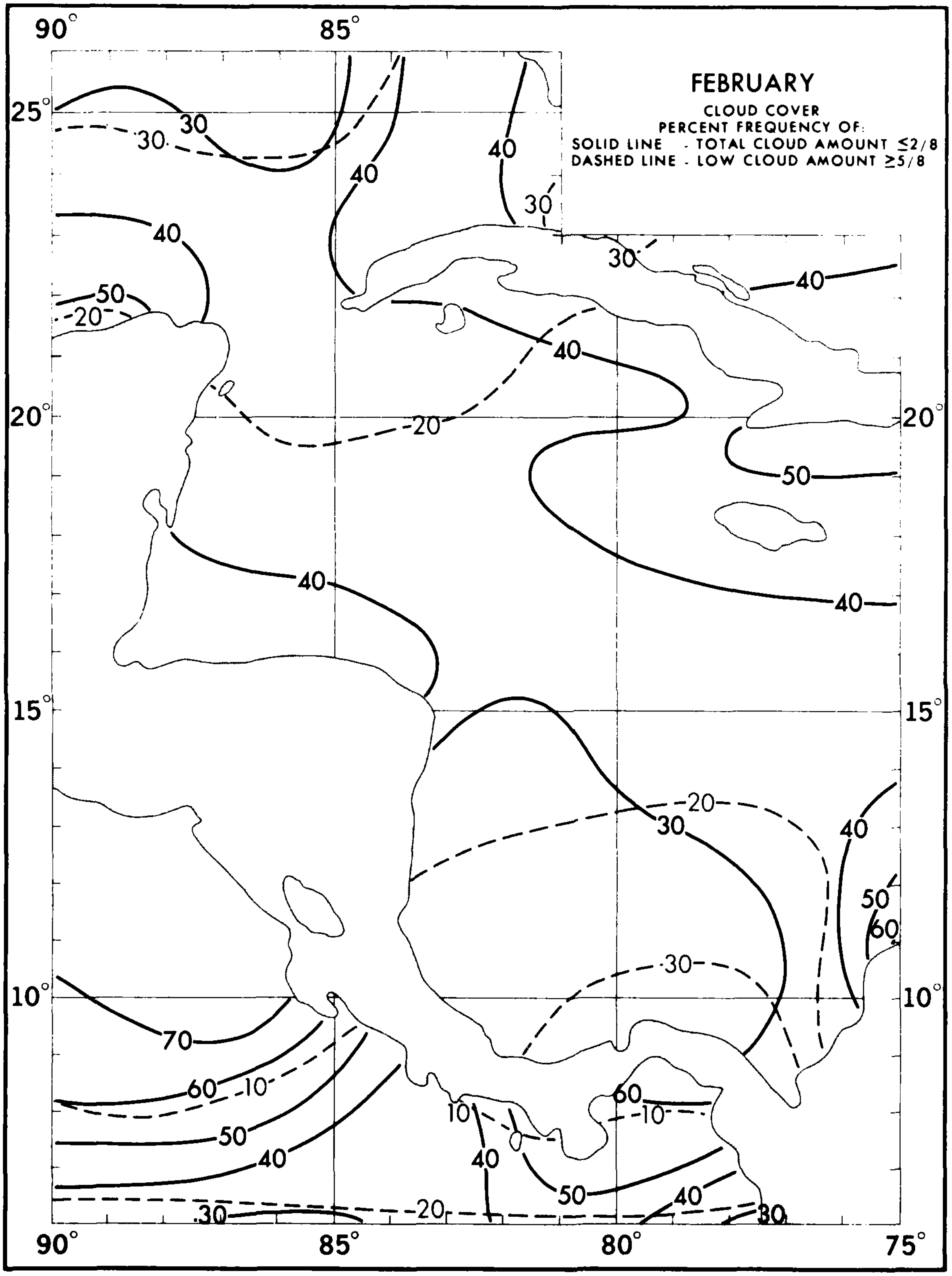
JANUARY
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°

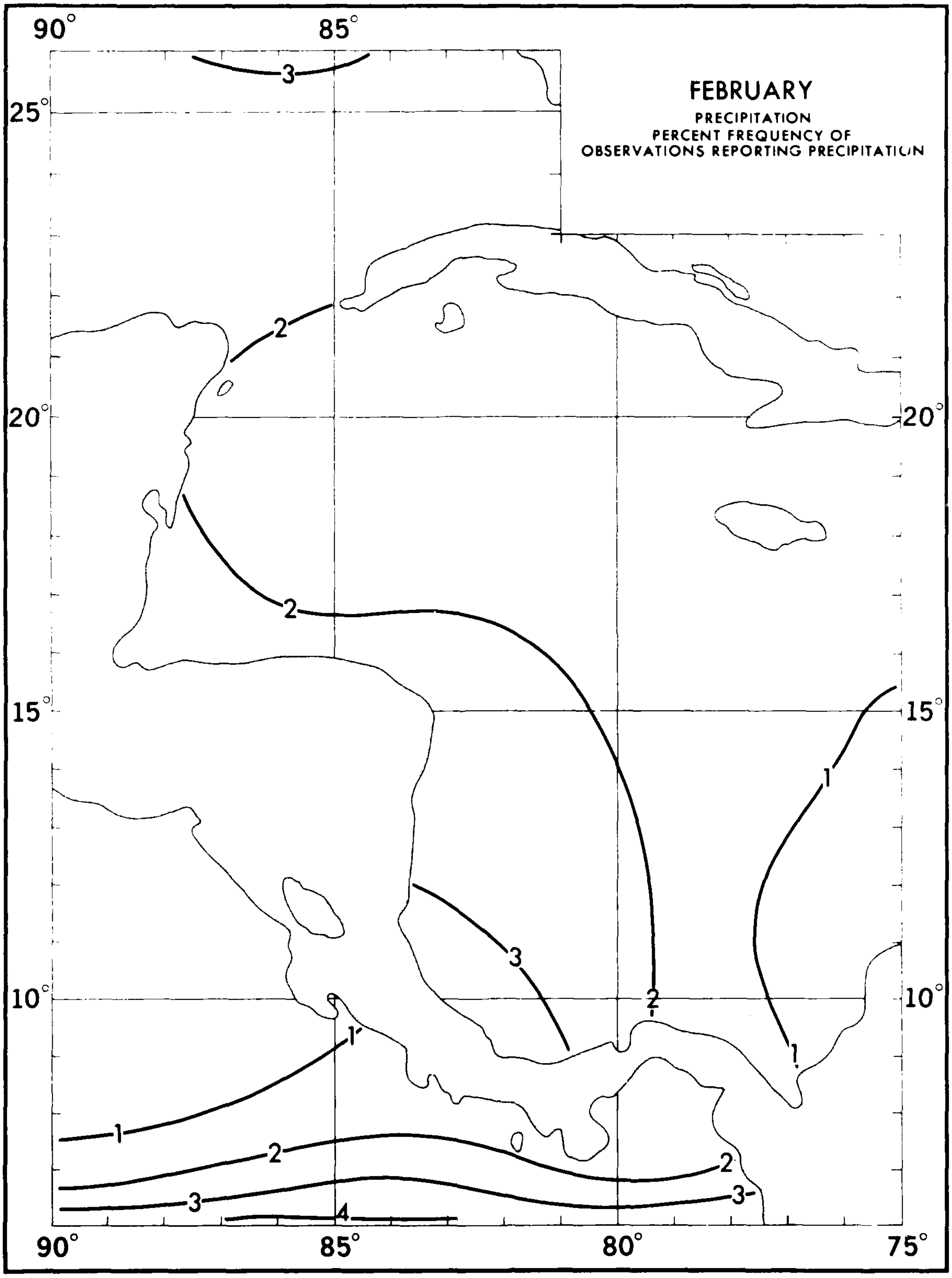


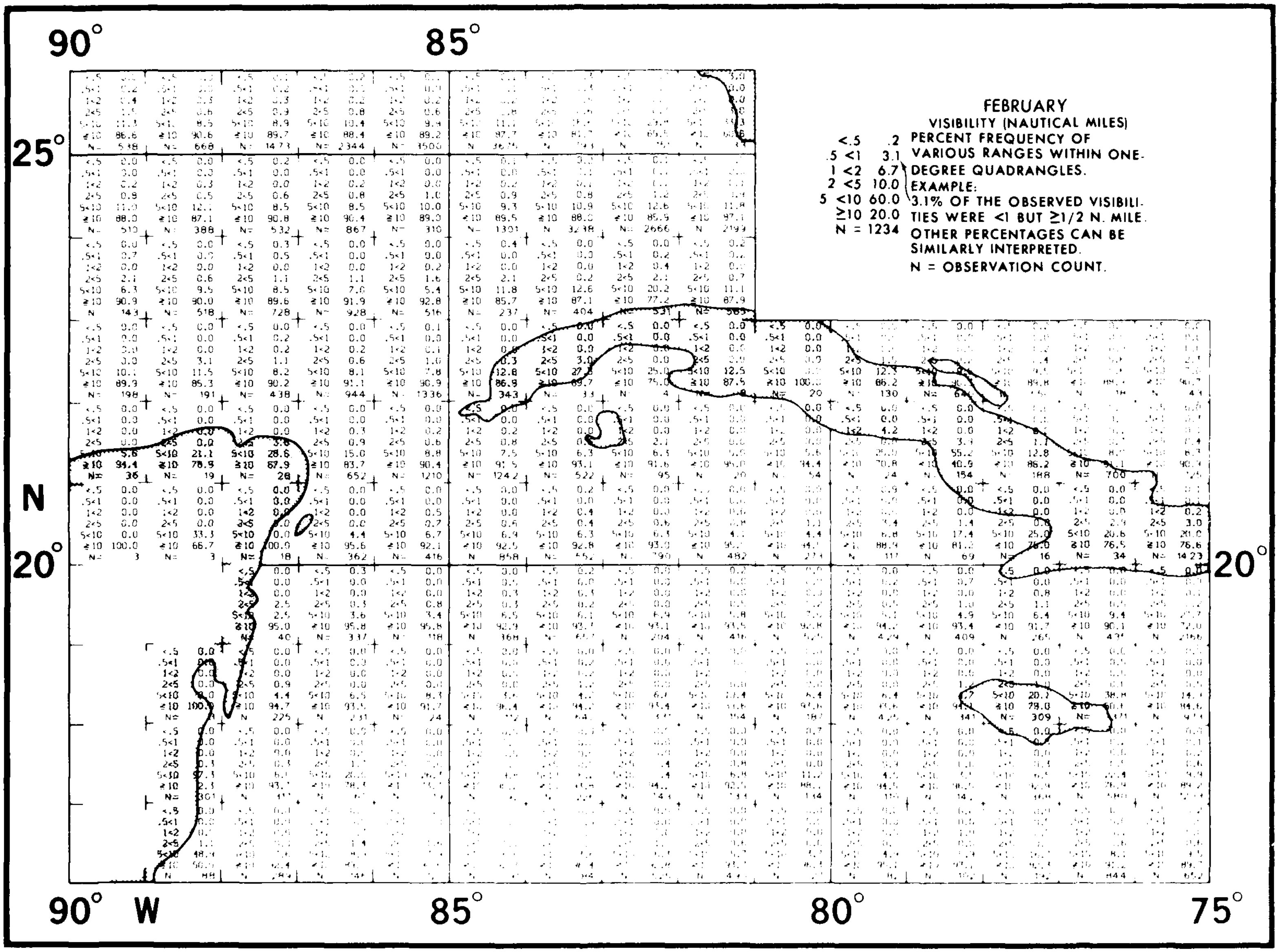
JANUARY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
70 > 70 %
< 10 %
90°
85°
80°
75°
25°
20°
15°
10°

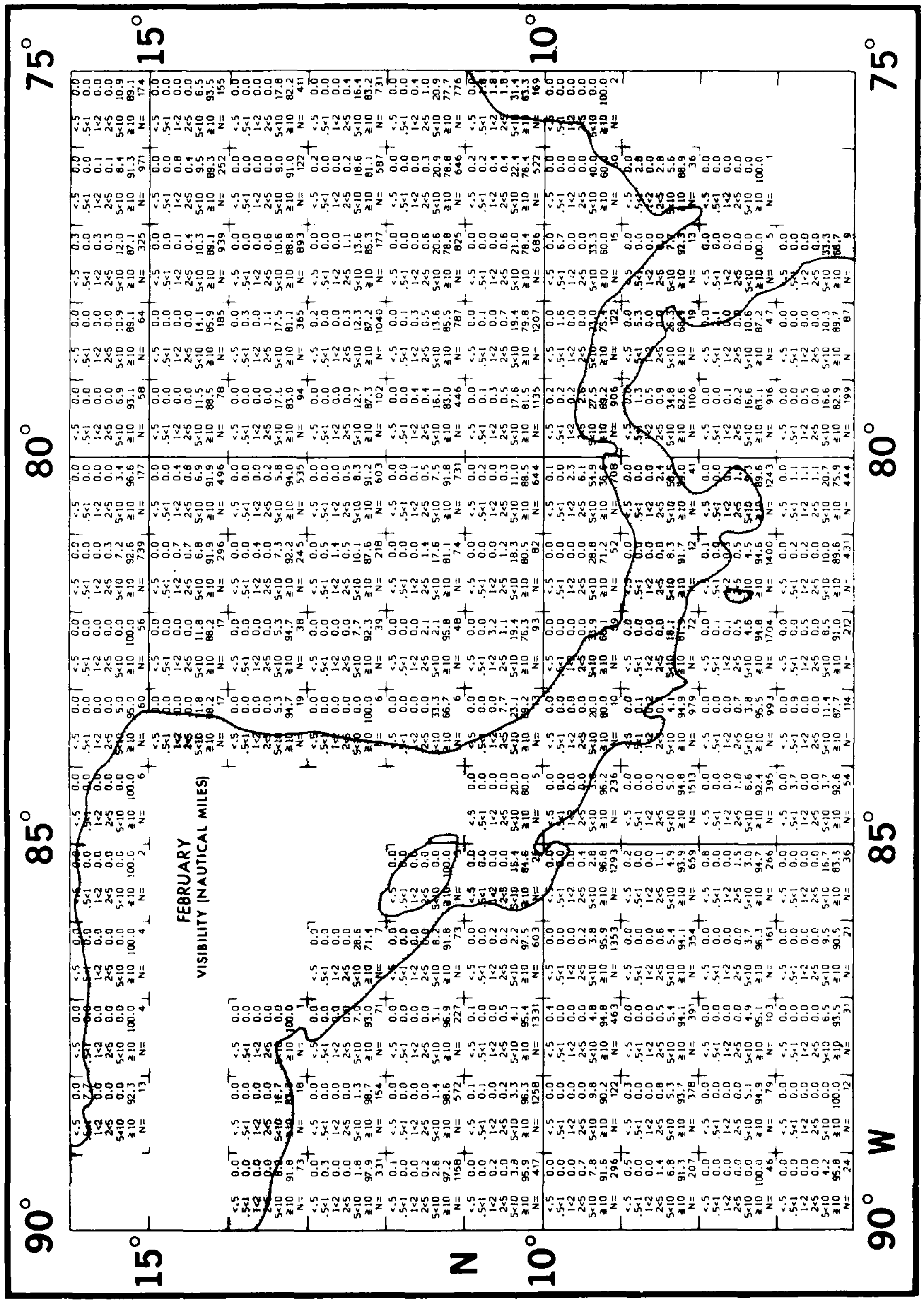

JANUARY
WAVE HEIGHT-FREQUENCIES
≤2 10.0 PERCENT FREQUENCY OF
3-4 20.0 VARIOUS RANGES WITHIN ONE-
5-6 30.0 DEGREE QUADRANGLES.
7-9 20.0 EXAMPLE:
10-12 10.0 30.0% OF ALL OBSERVED WAVE
≥13 10.0 HEIGHTS WERE IN THE RANGE 5
N = 1363 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES
WERE SELECTED FROM THE HIGHER
OF SEA OR SWELL WHEN BOTH
WERE REPORTED.
90°
85°
80°
75°
25°
20°
N
W

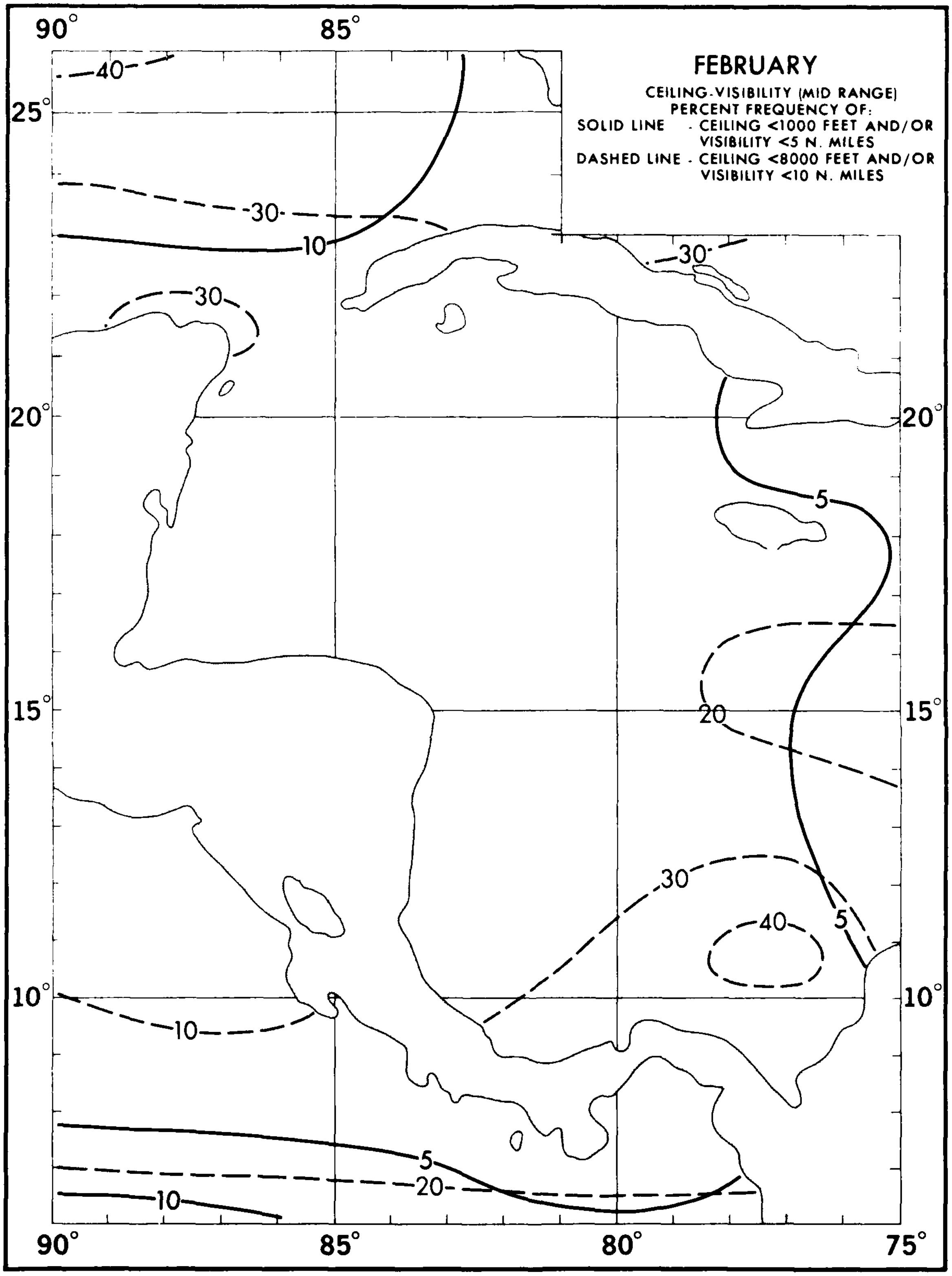

JANUARY
WAVE HEIGHT FREQUENCIES
90°
85°
80°
75°
15°
10°
N
W

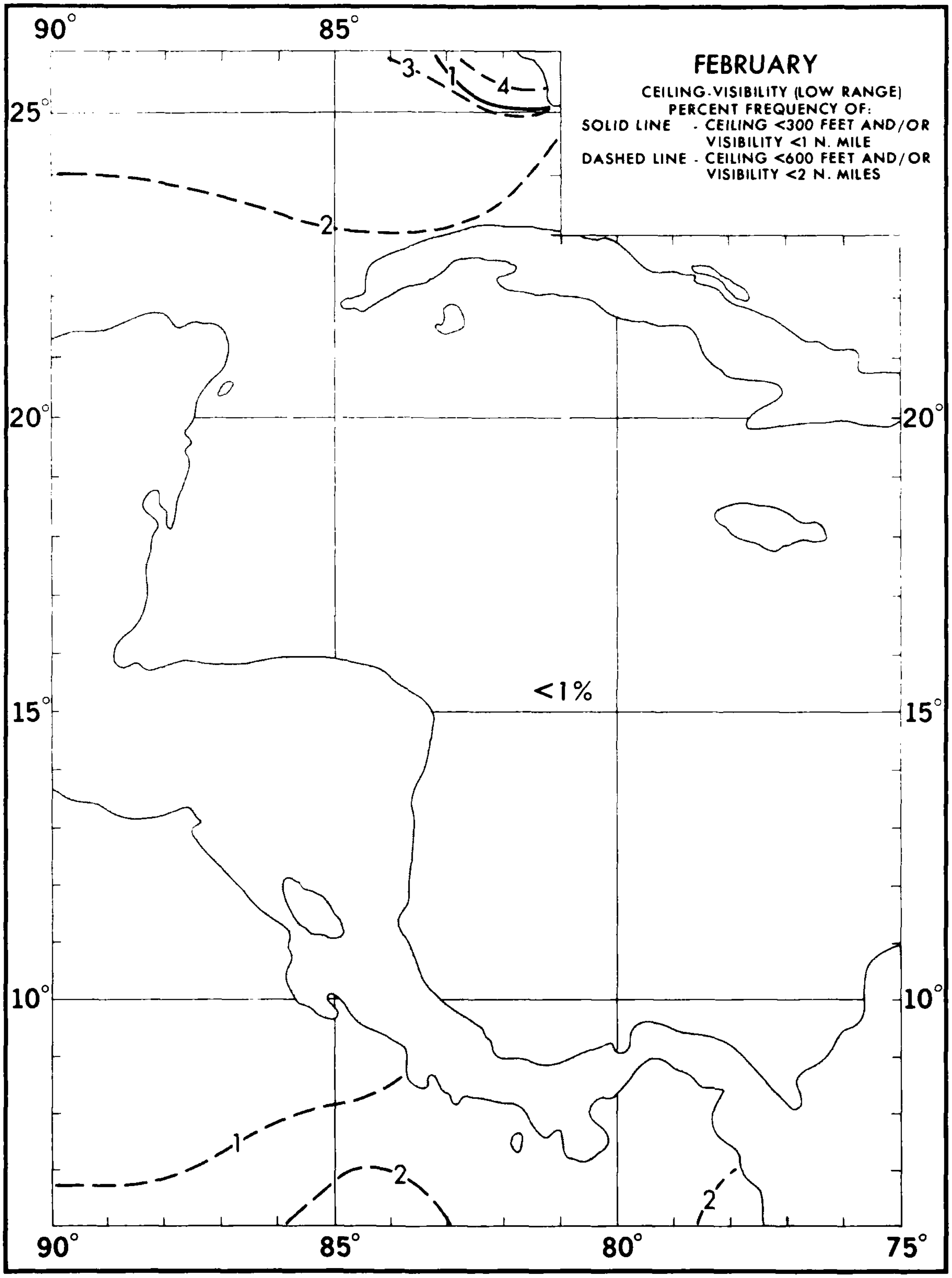

FEBRUARY
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°


FEBRUARY
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°
1
2
3
4

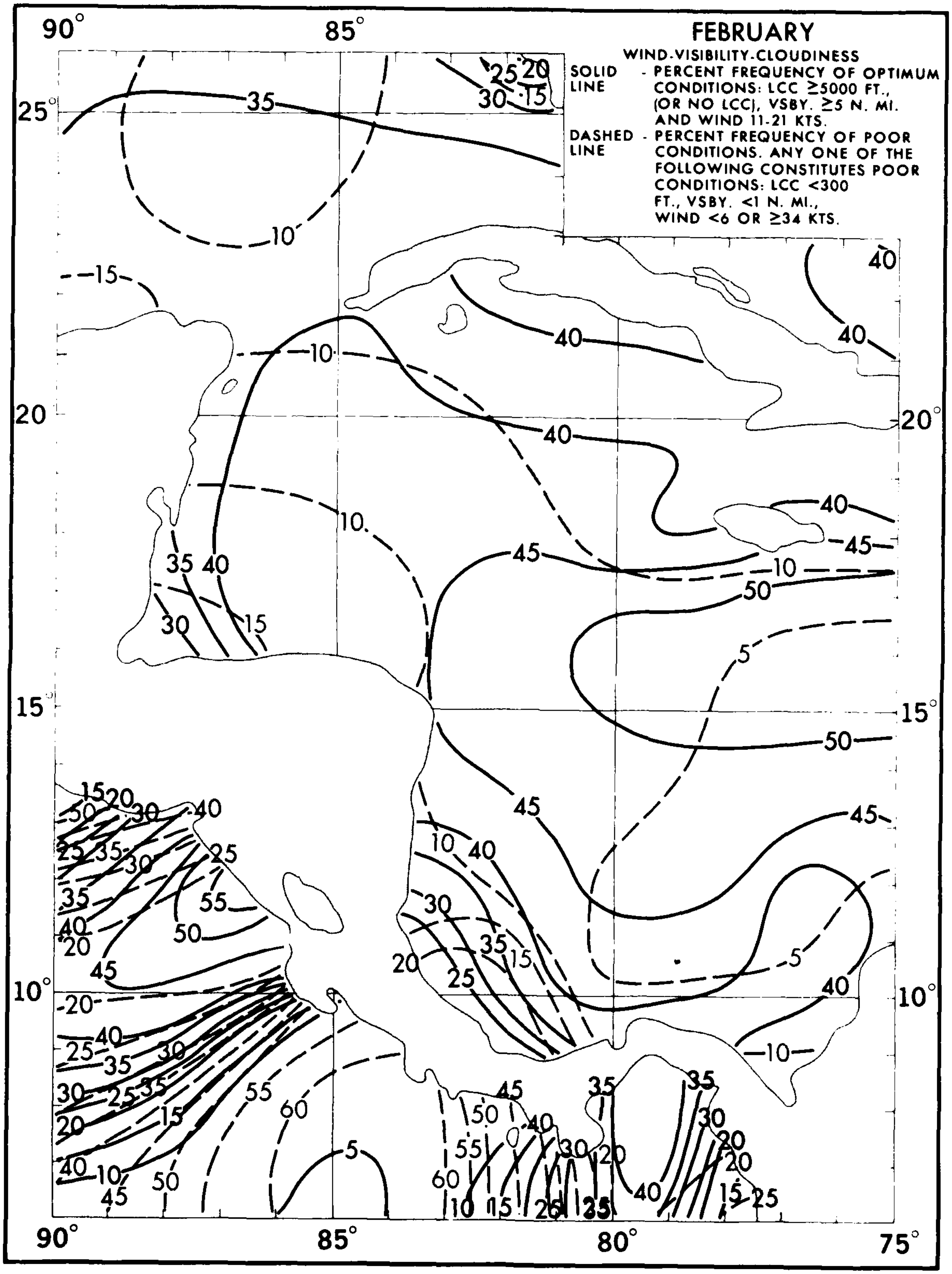

FEBRUARY
VISIBILITY (NAUTICAL MILES)
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
25°
N
20°
90° W
85°
80°
75°
20°

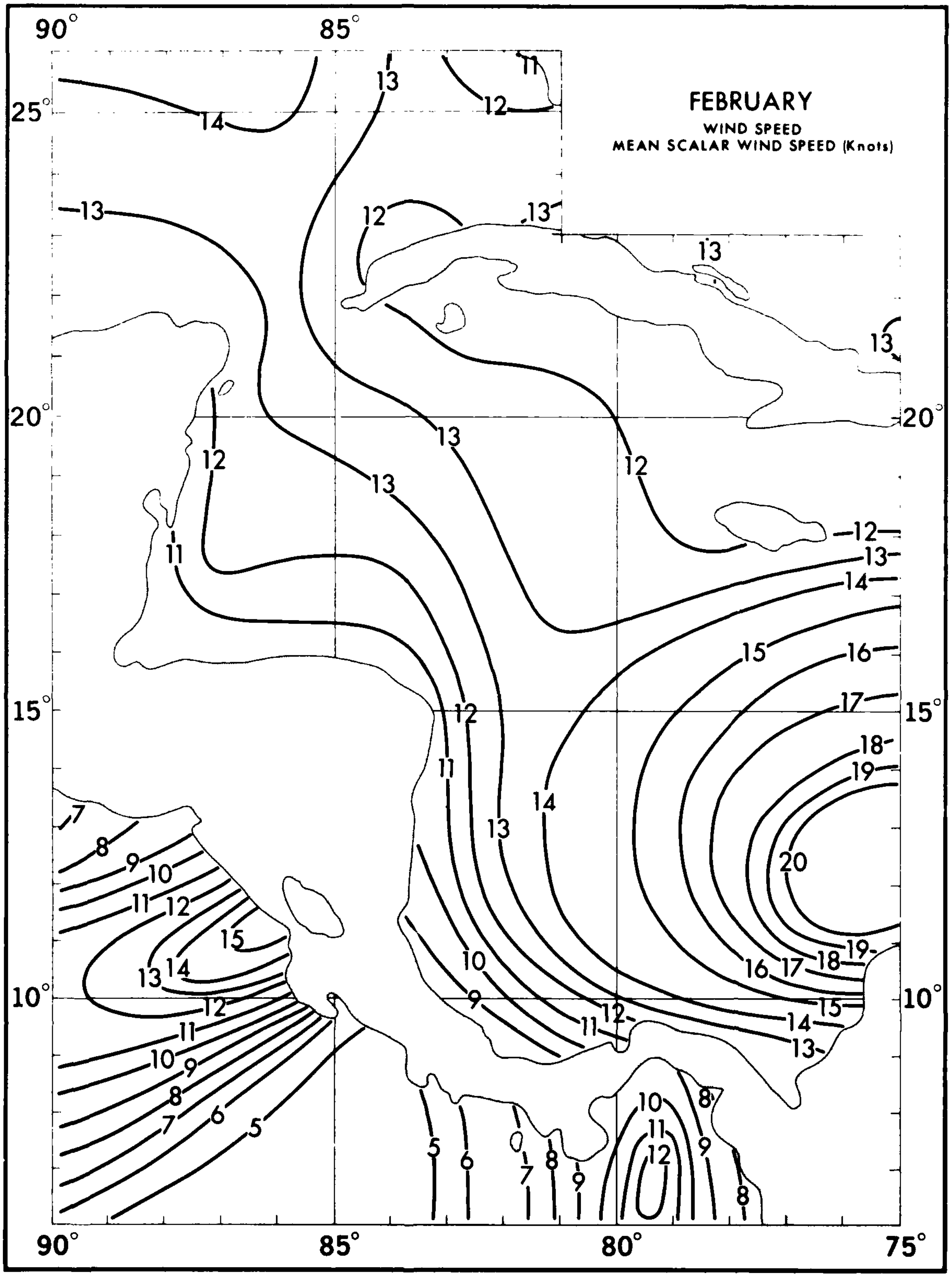

FEBRUARY
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
10°
N
W

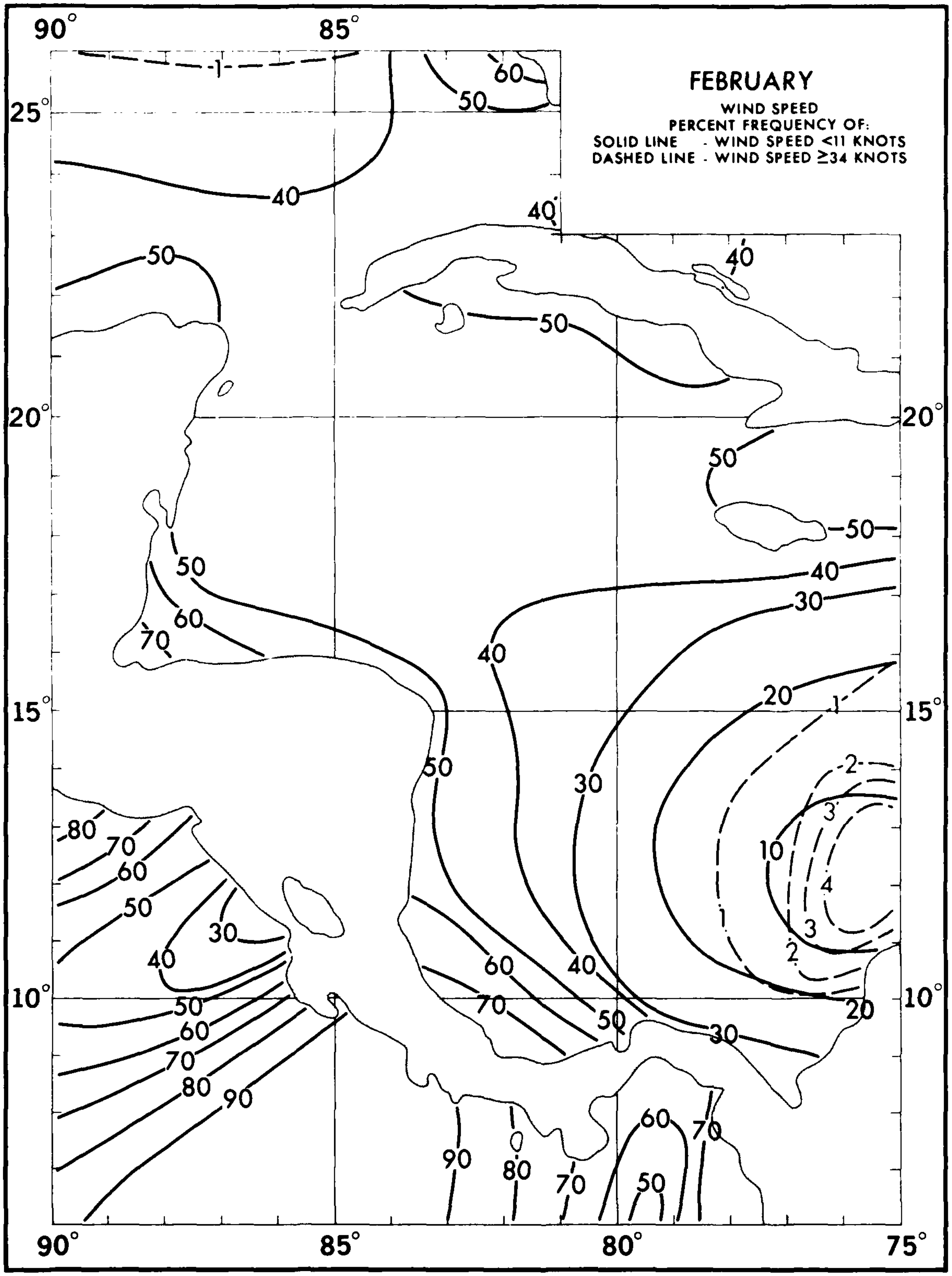

FEBRUARY
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
40
30
10
30
30
5
20
30
40
5
10
5
20
10

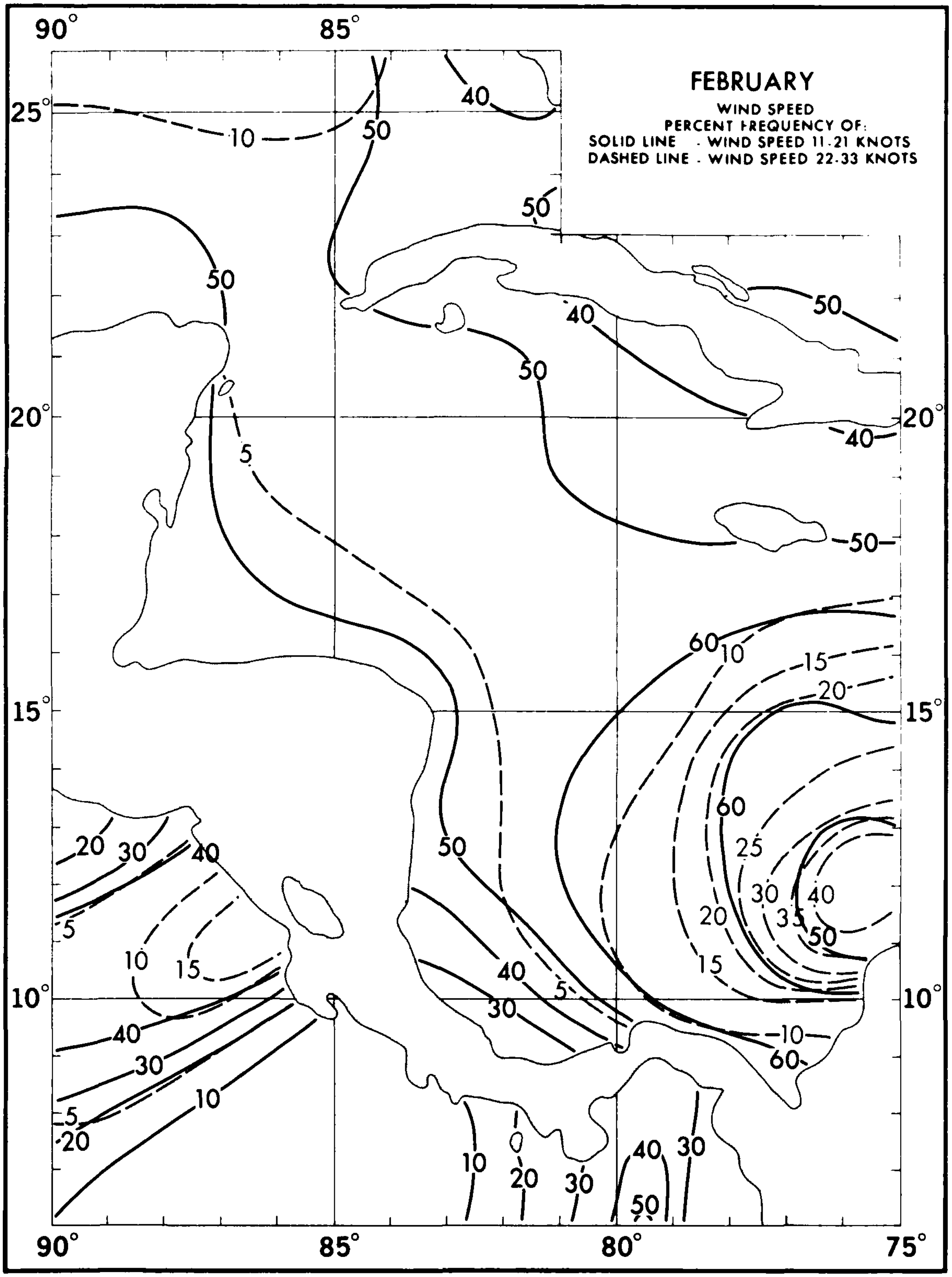


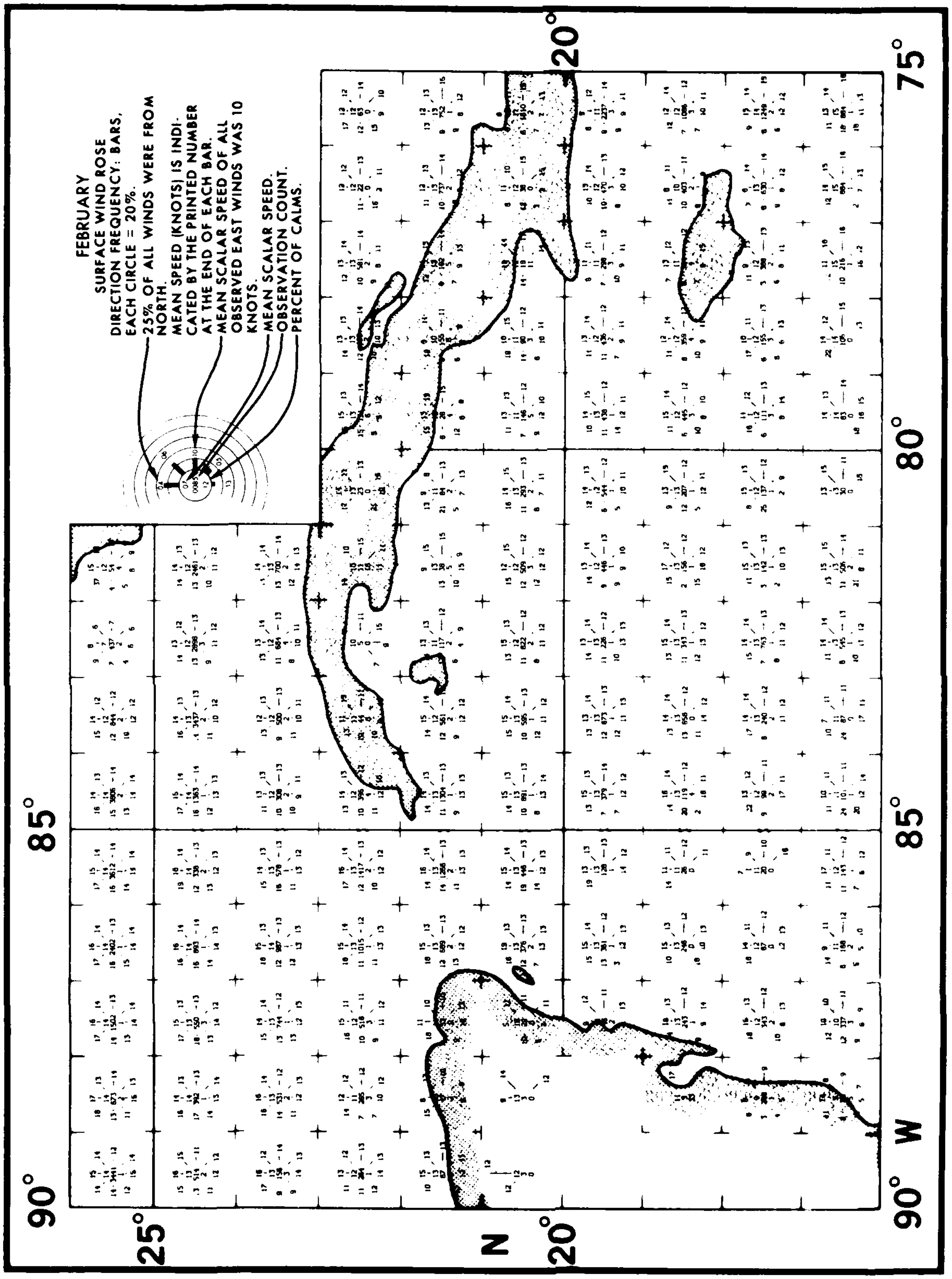
FEBRUARY
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
3
1
4
2
<1%

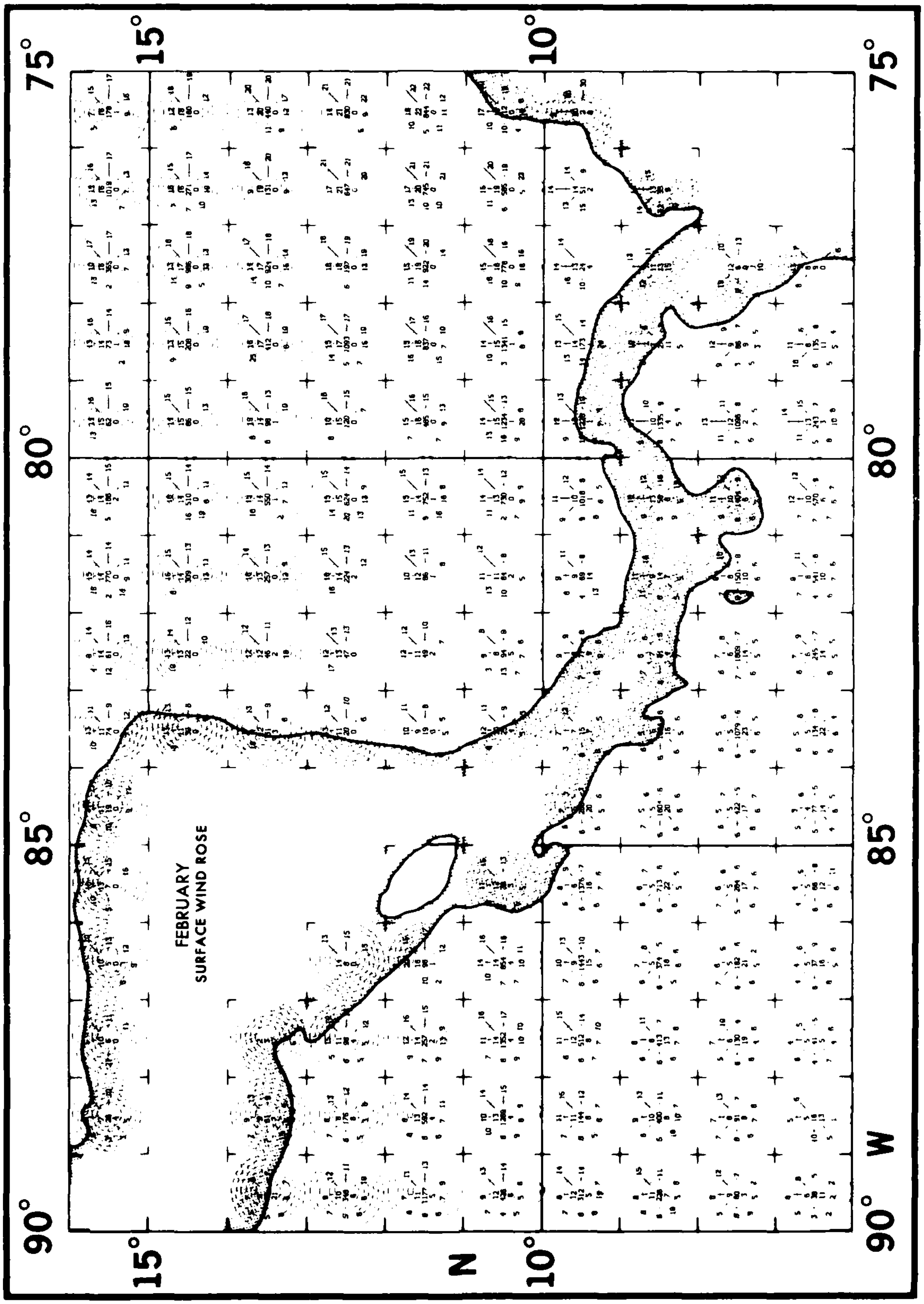

FEBRUARY
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°

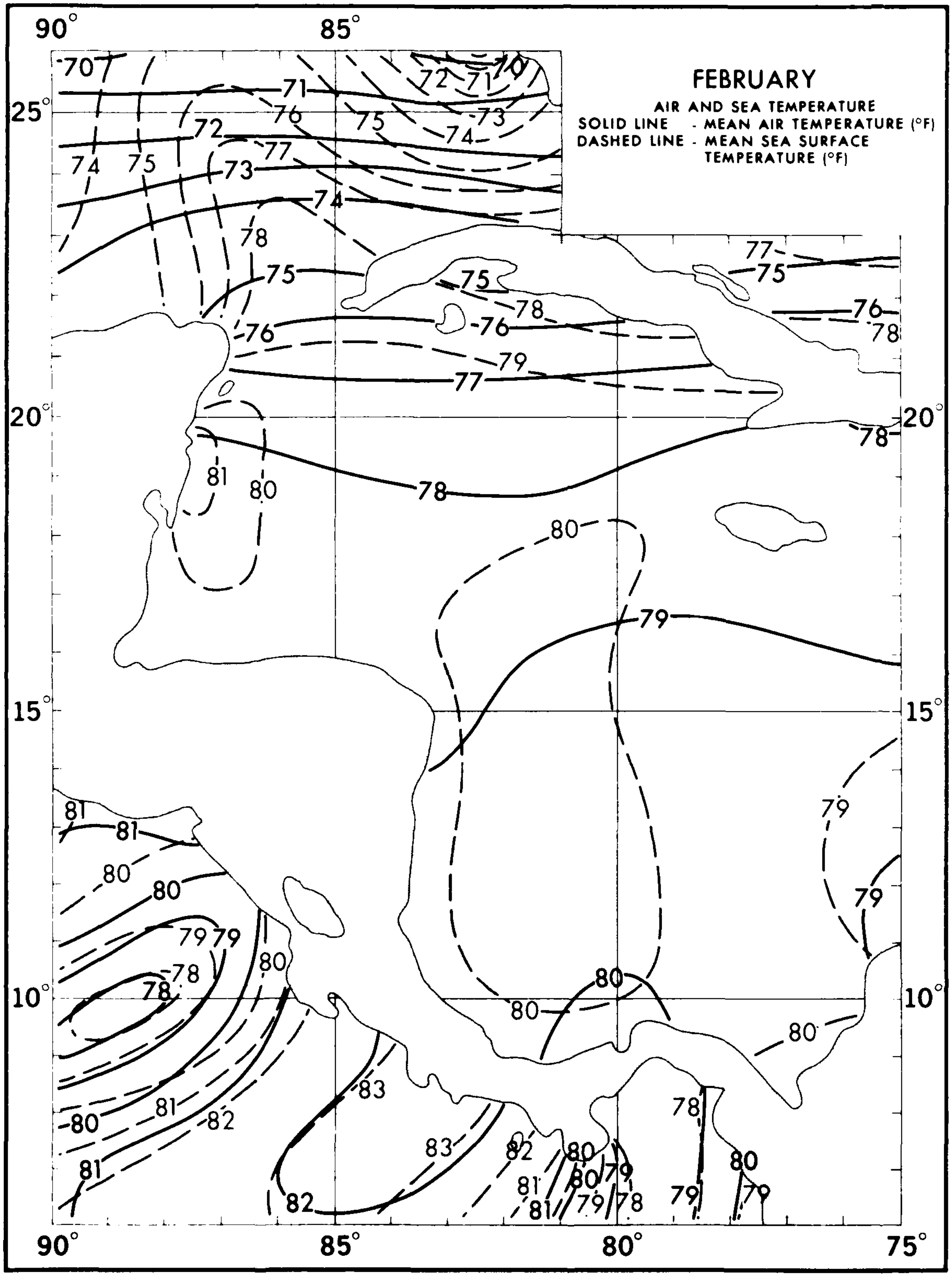

FEBRUARY
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°

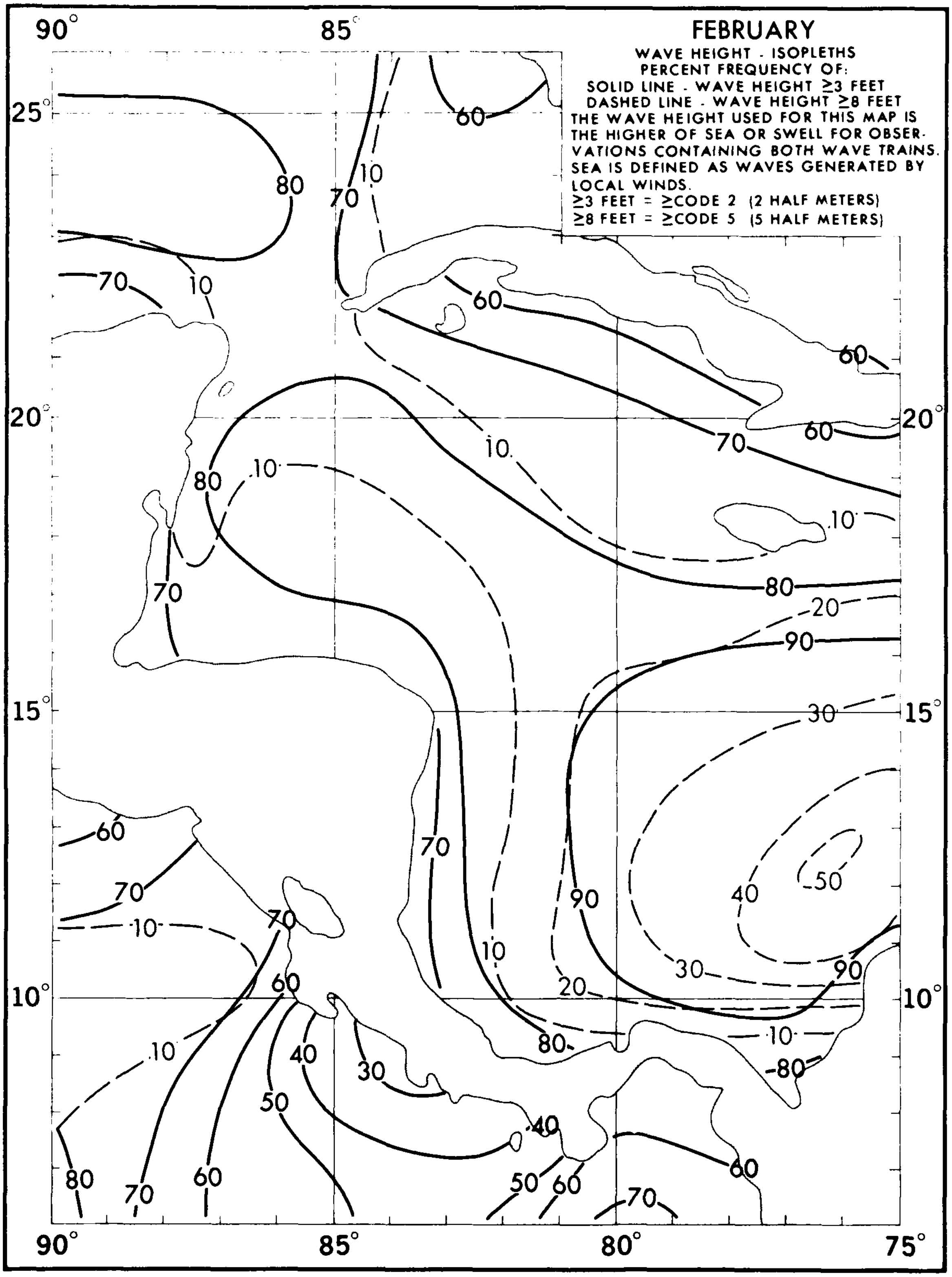

FEBRUARY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°


FEBRUARY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°

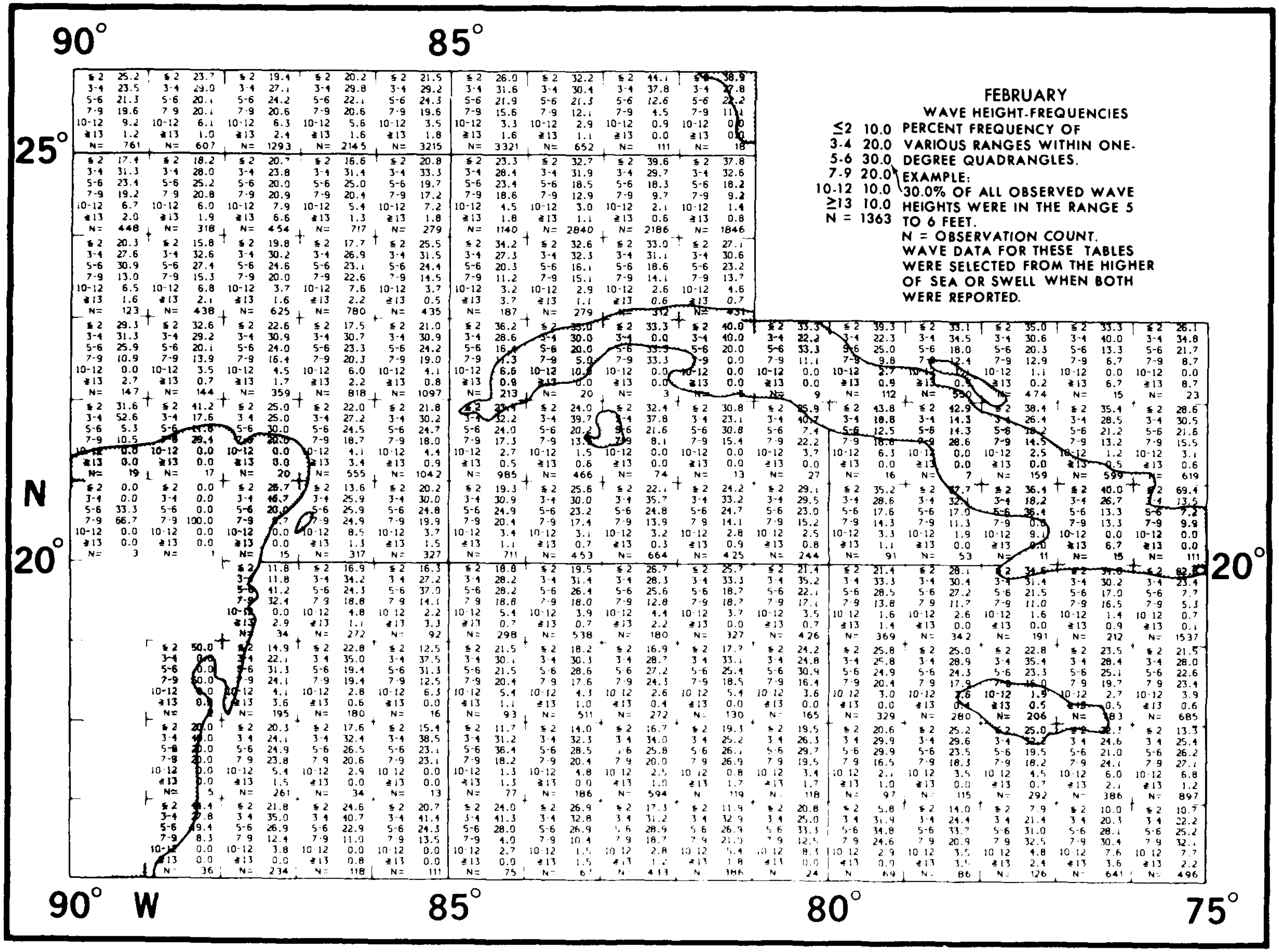

FEBRUARY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
80°
75°
25°
20°
N
W

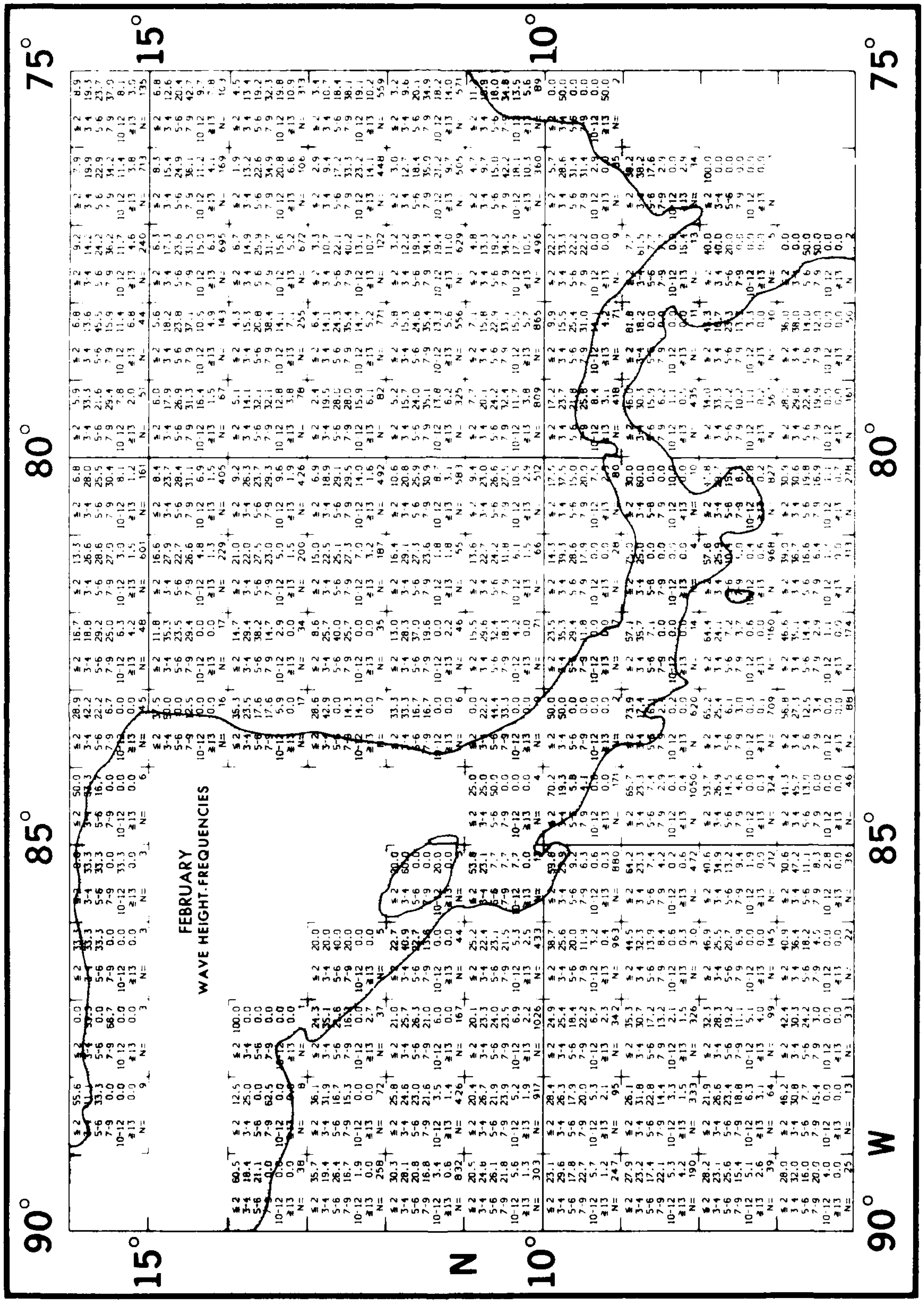

FEBRUARY
SURFACE WIND ROSE
75°
80°
85°
90°
15°
10°
N
W

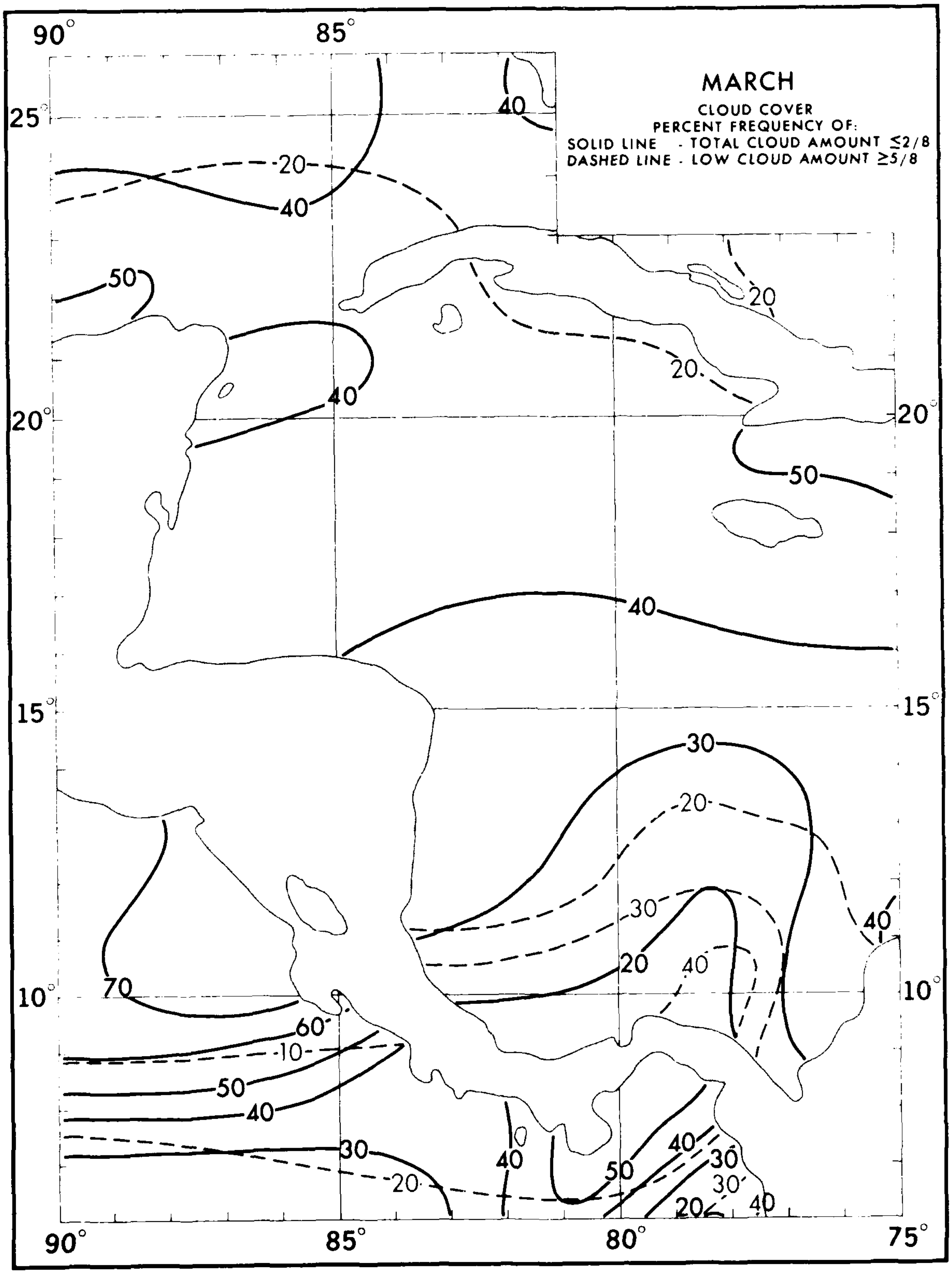

FEBRUARY
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°

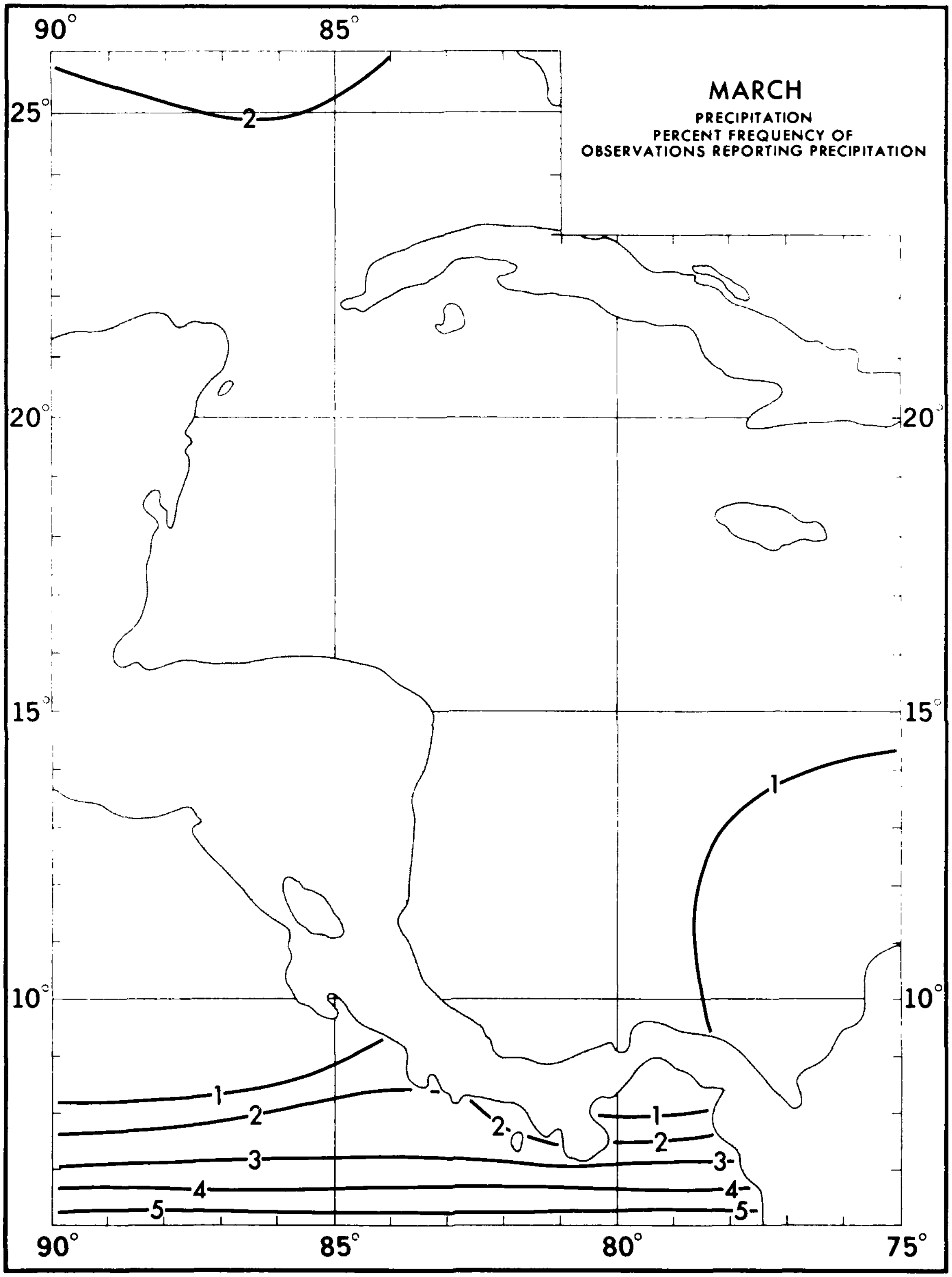


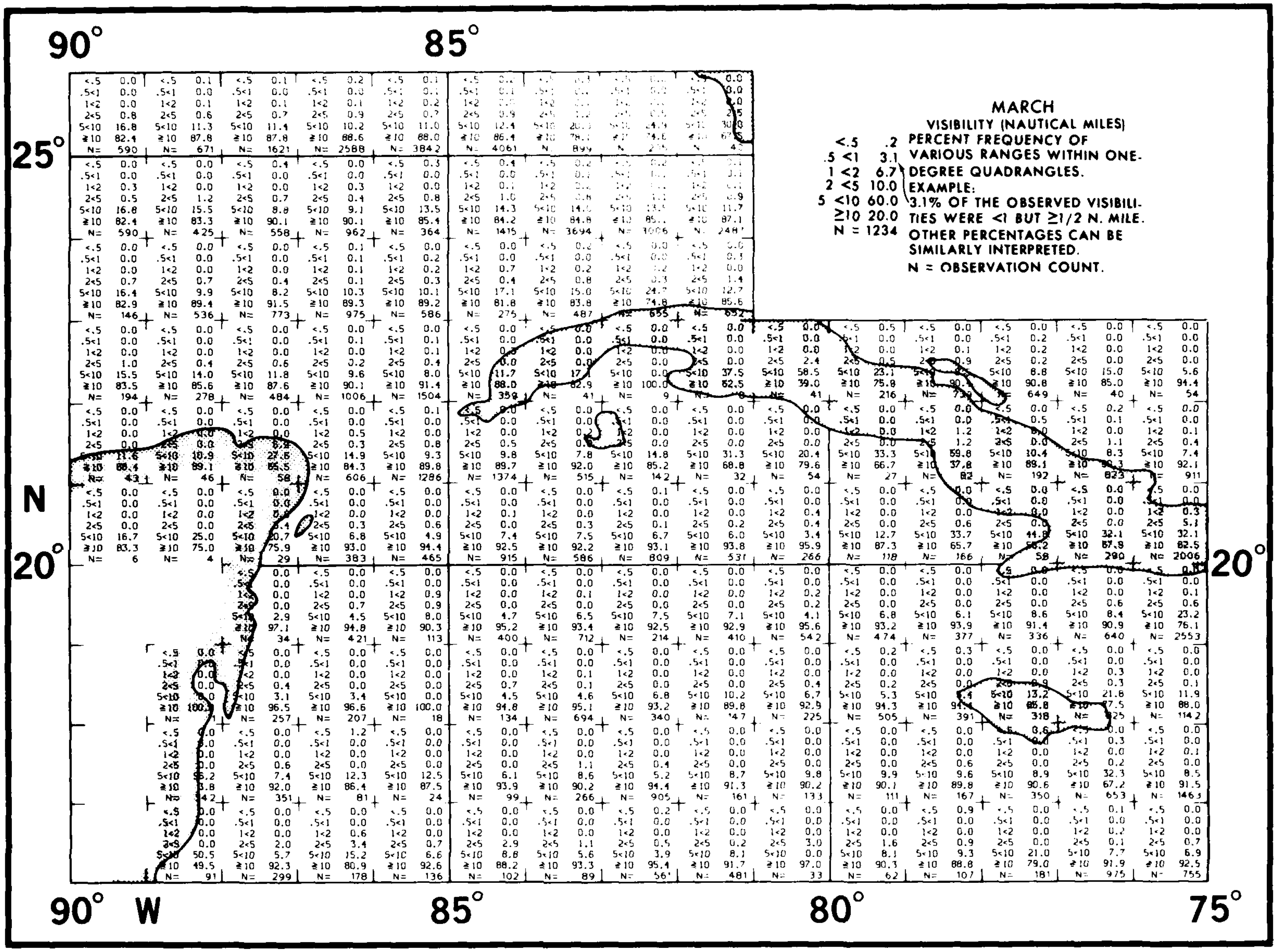
FEBRUARY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°

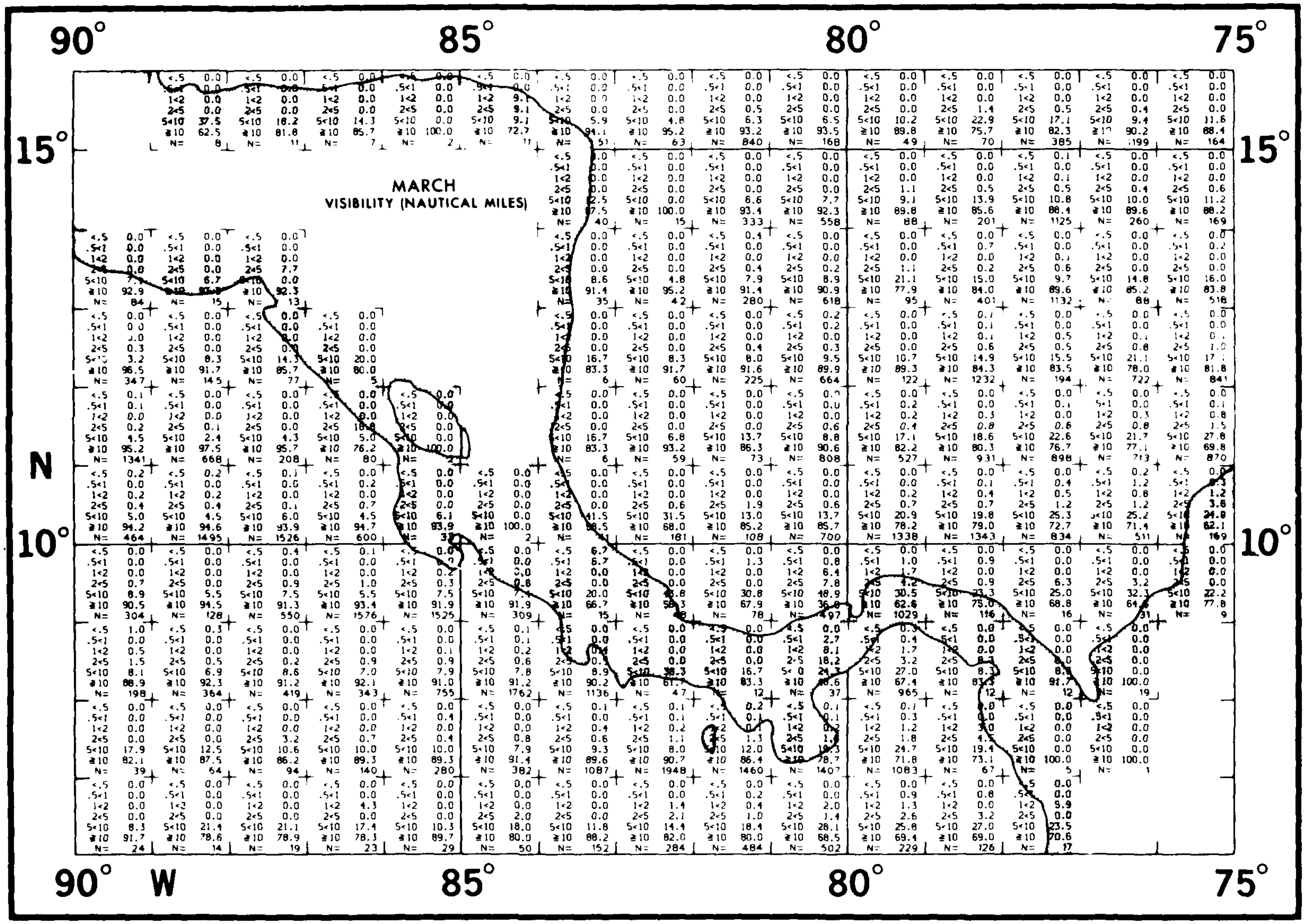

90°
85°
80°
75°
25°
20°
N
W
FEBRUARY
WAVE HEIGHT-FREQUENCIES
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.

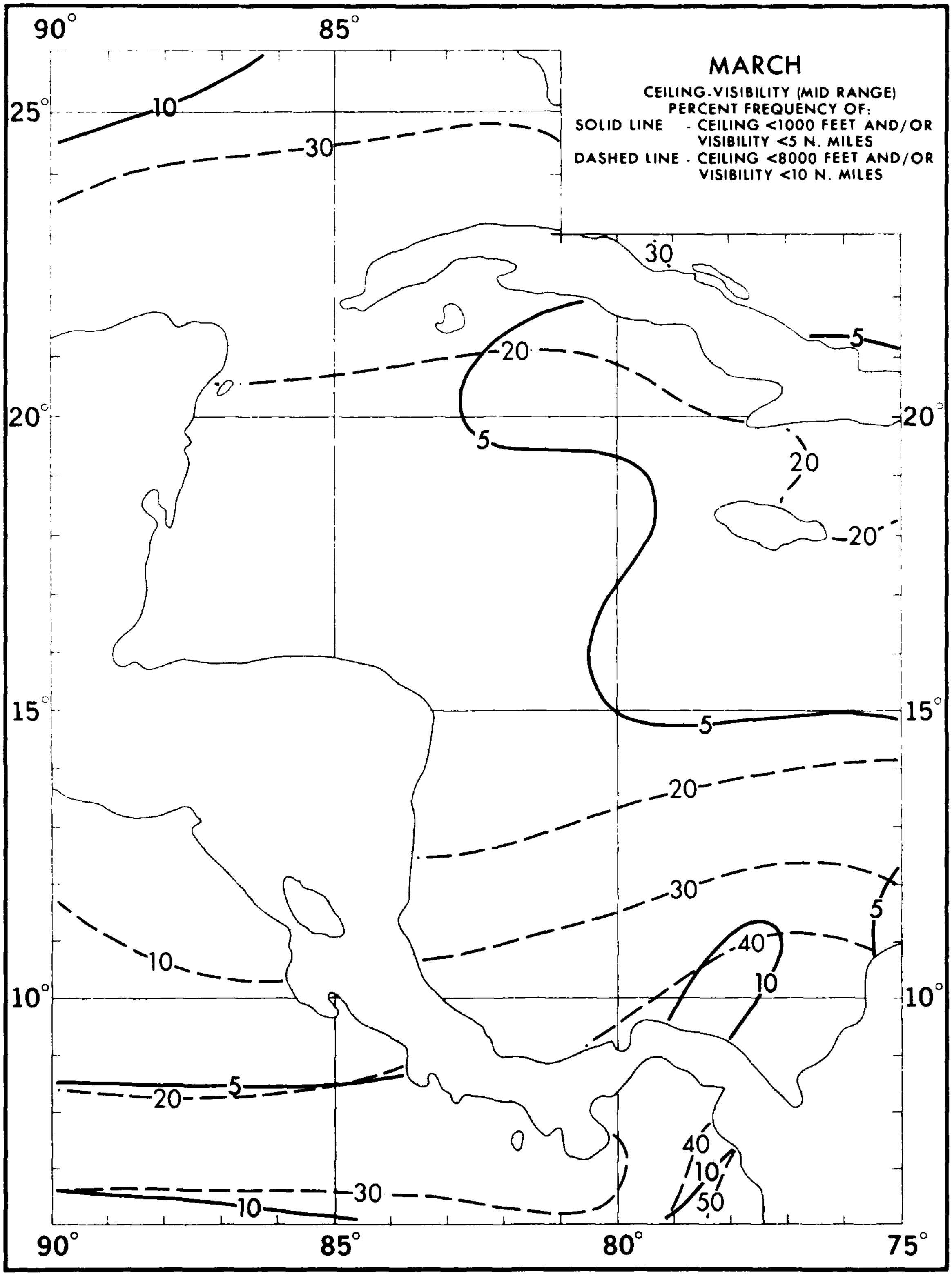

FEBRUARY
WAVE HEIGHT FREQUENCIES
90°
85°
80°
75°
15°
10°
N
W

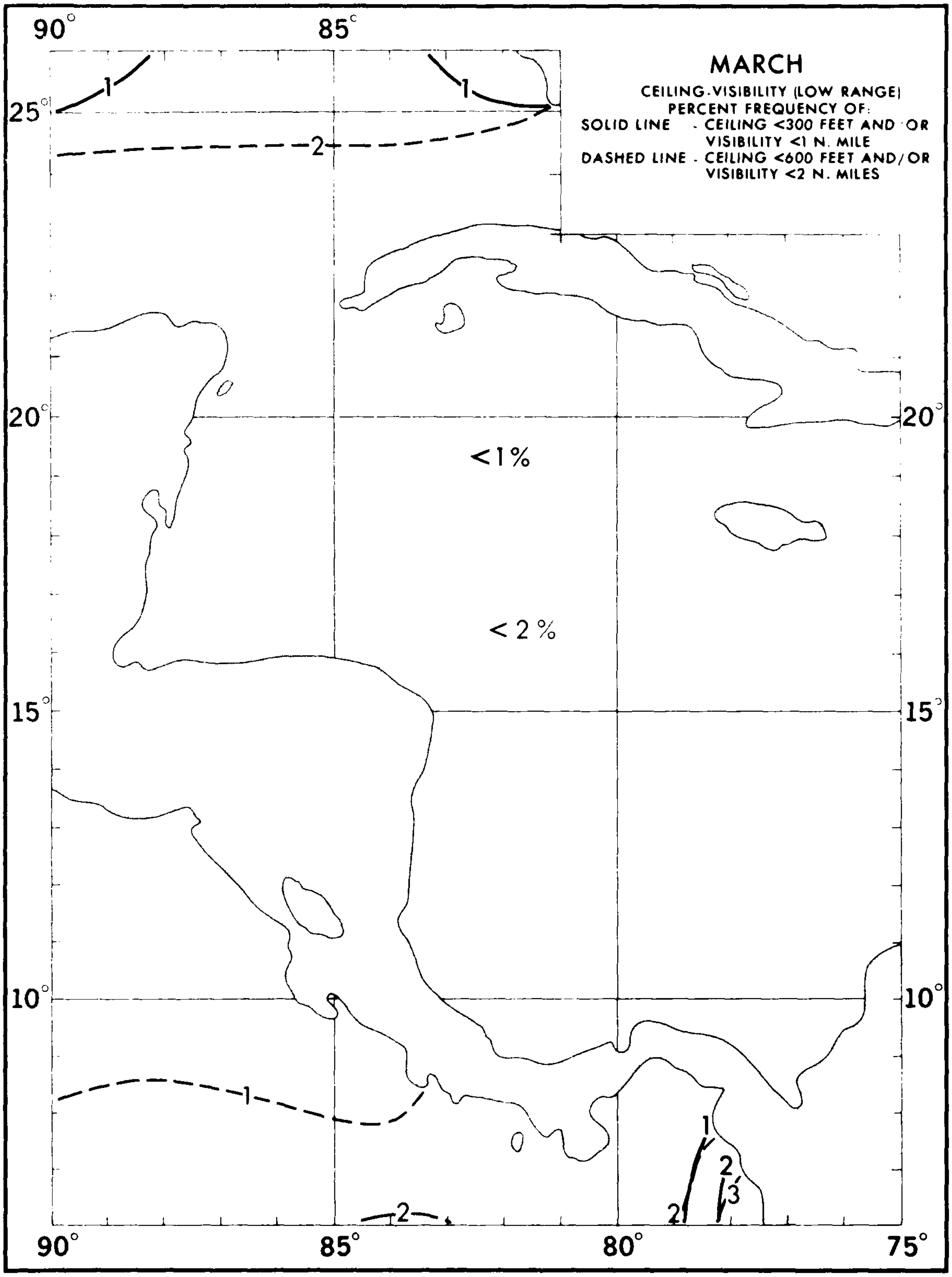

MARCH
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°

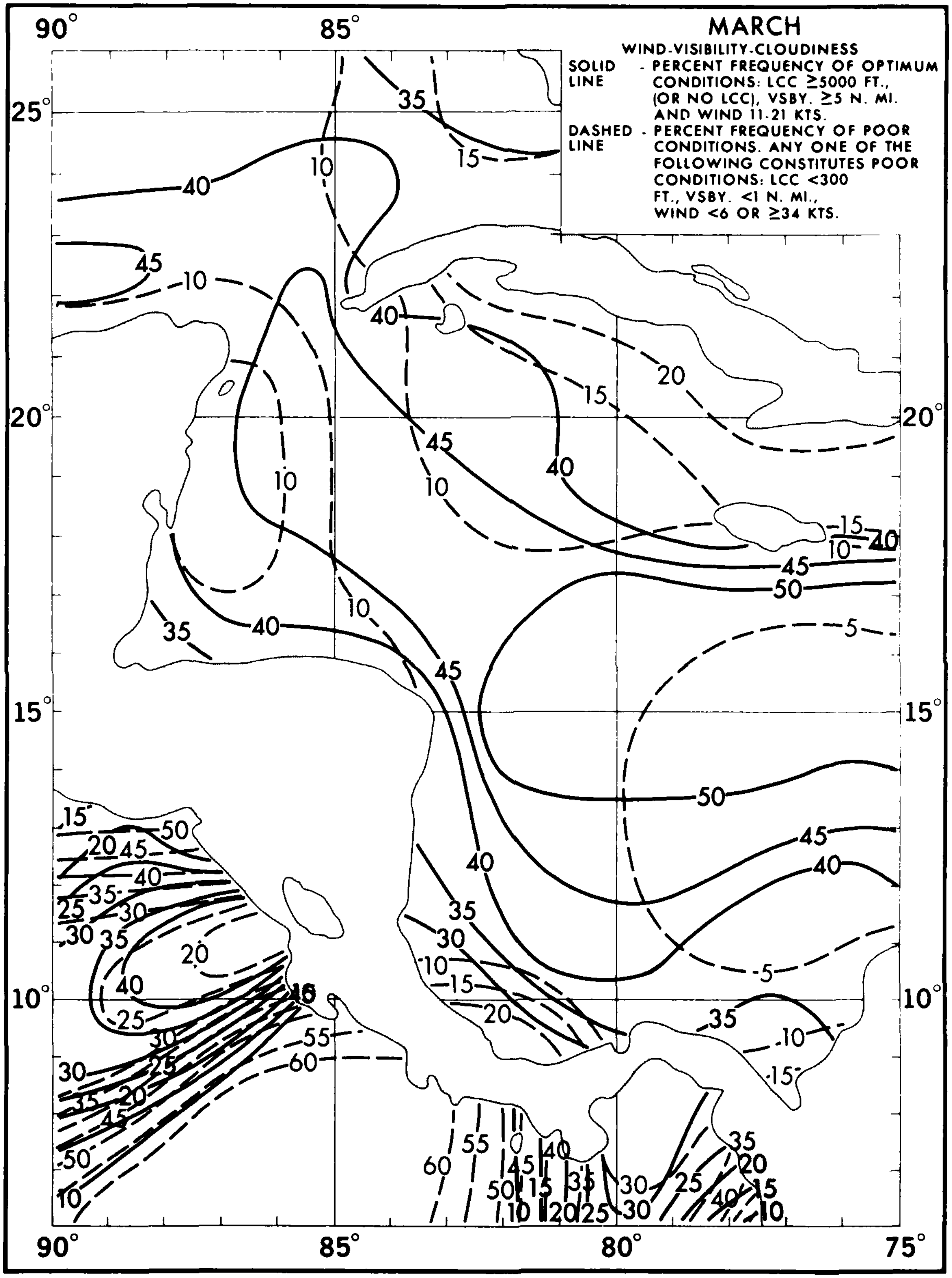

MARCH
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°
1
2
3
4
5

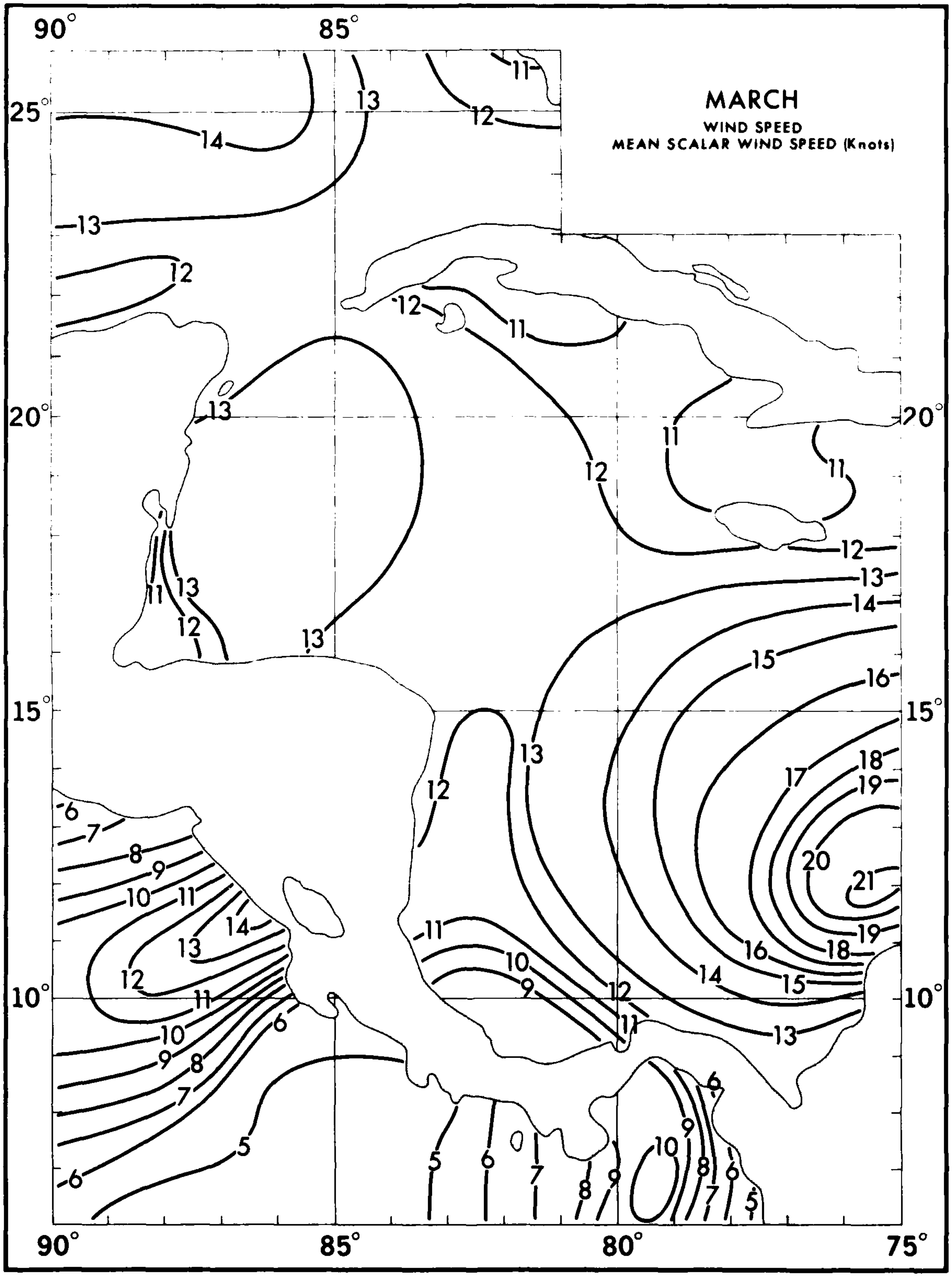

MARCH
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
80°
75°
25°
20°
N
W

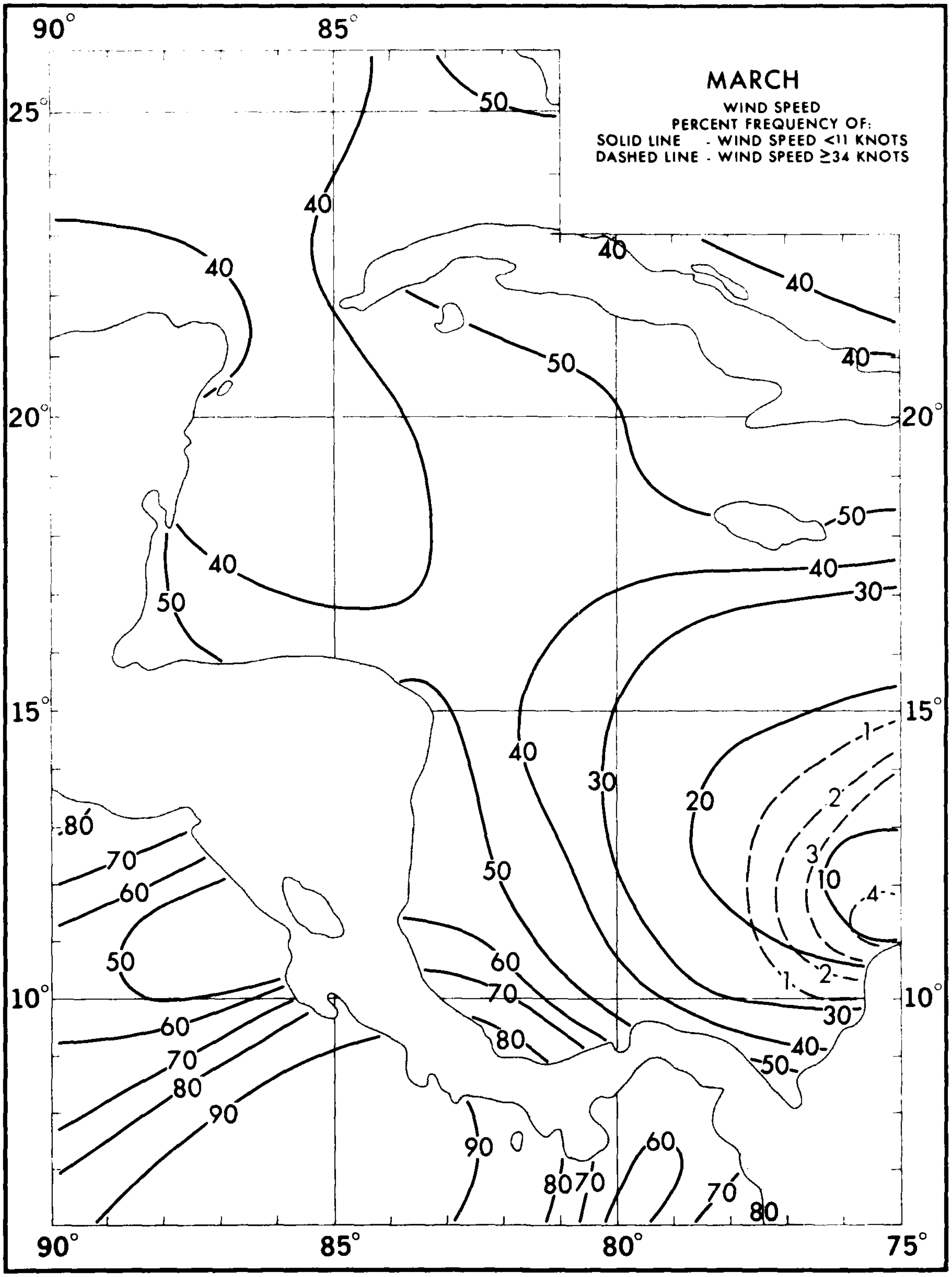

MARCH
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
10°
N
W

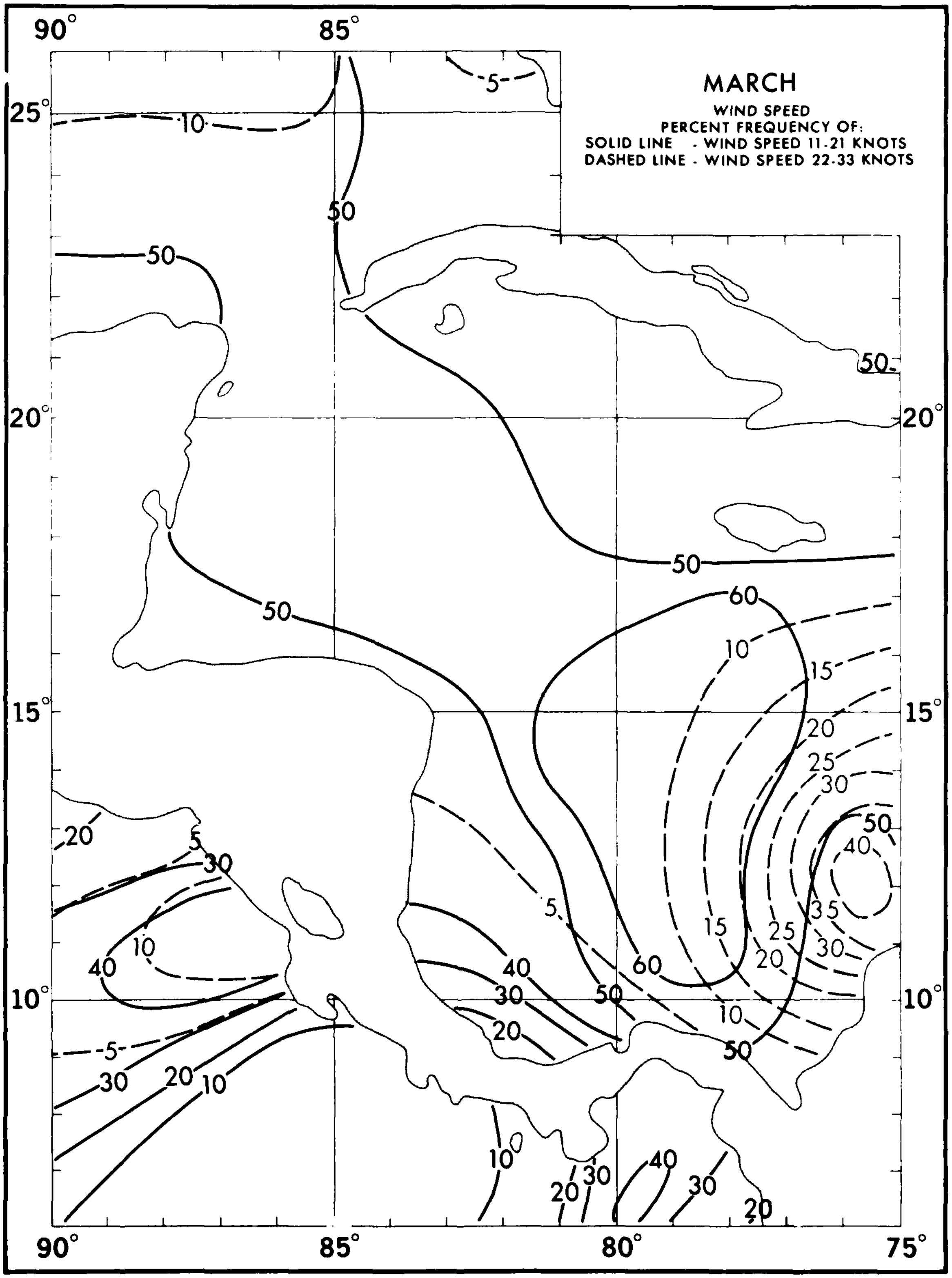

MARCH
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°

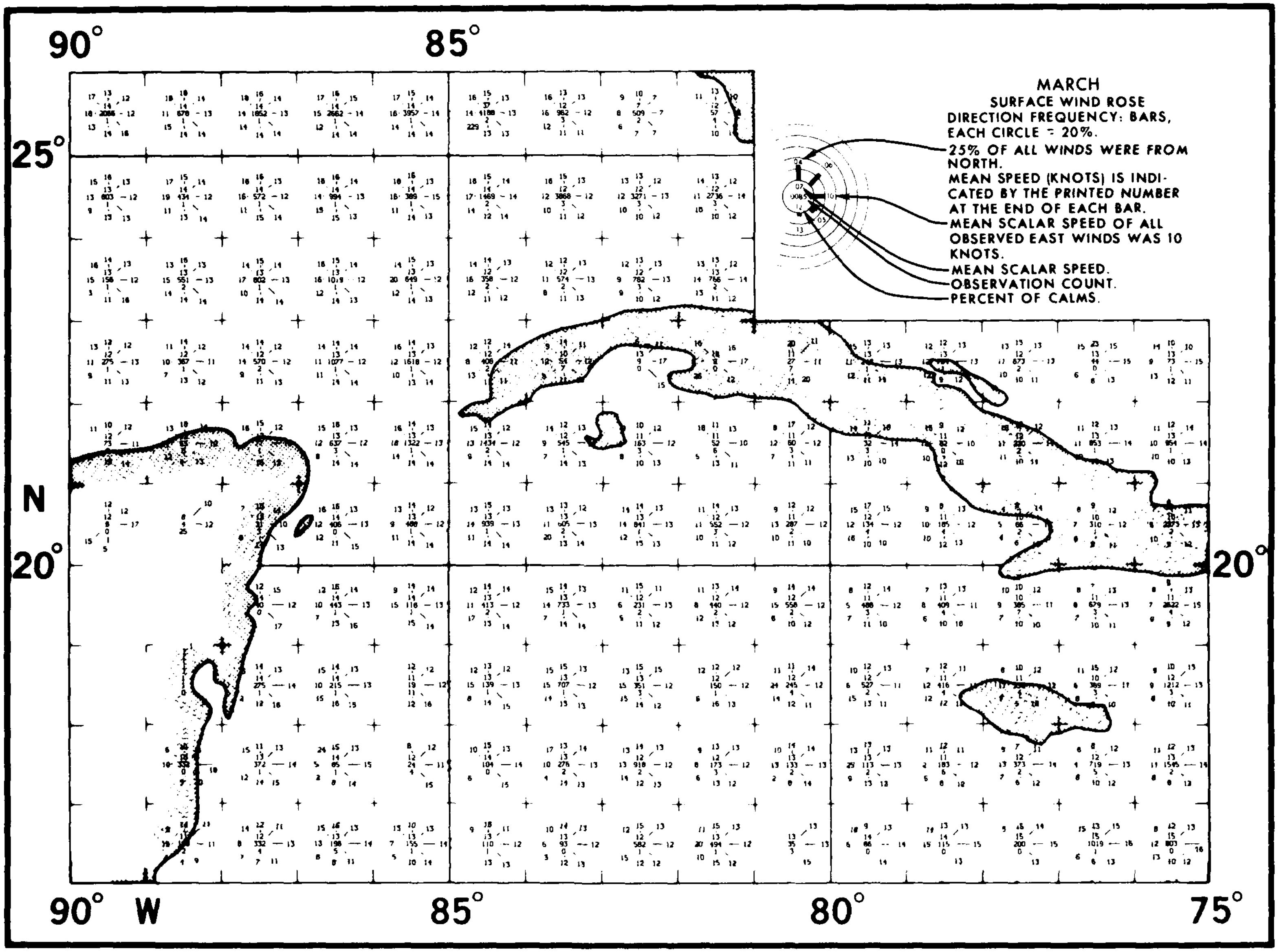

MARCH
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
<1%
< 2 %
90°
85°
80°
75°
25°
20°
15°
10°


MARCH
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°

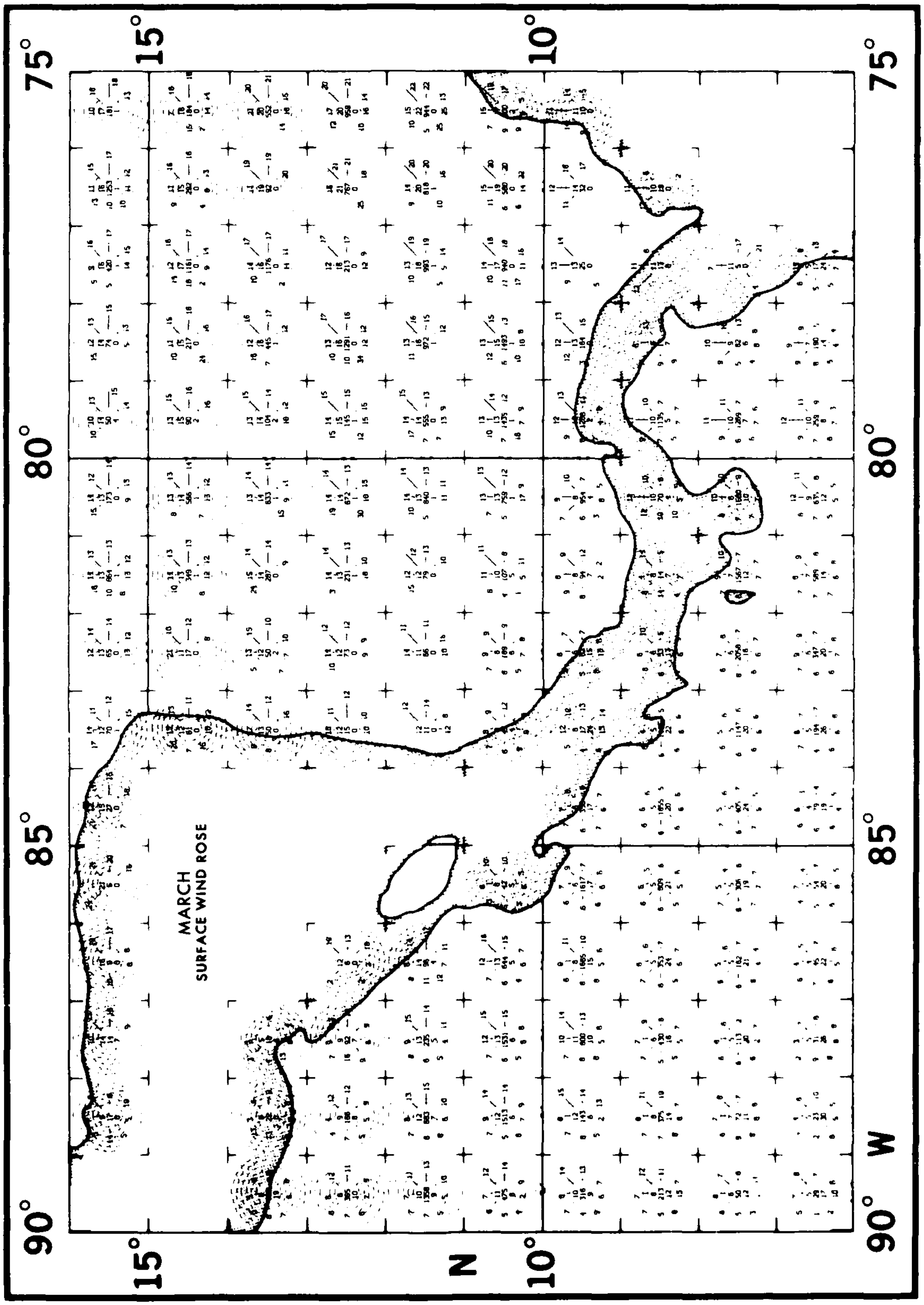

MARCH
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°
14
13
12
11
10
9
8
7
6
5
15
16
17
18
19
20
21

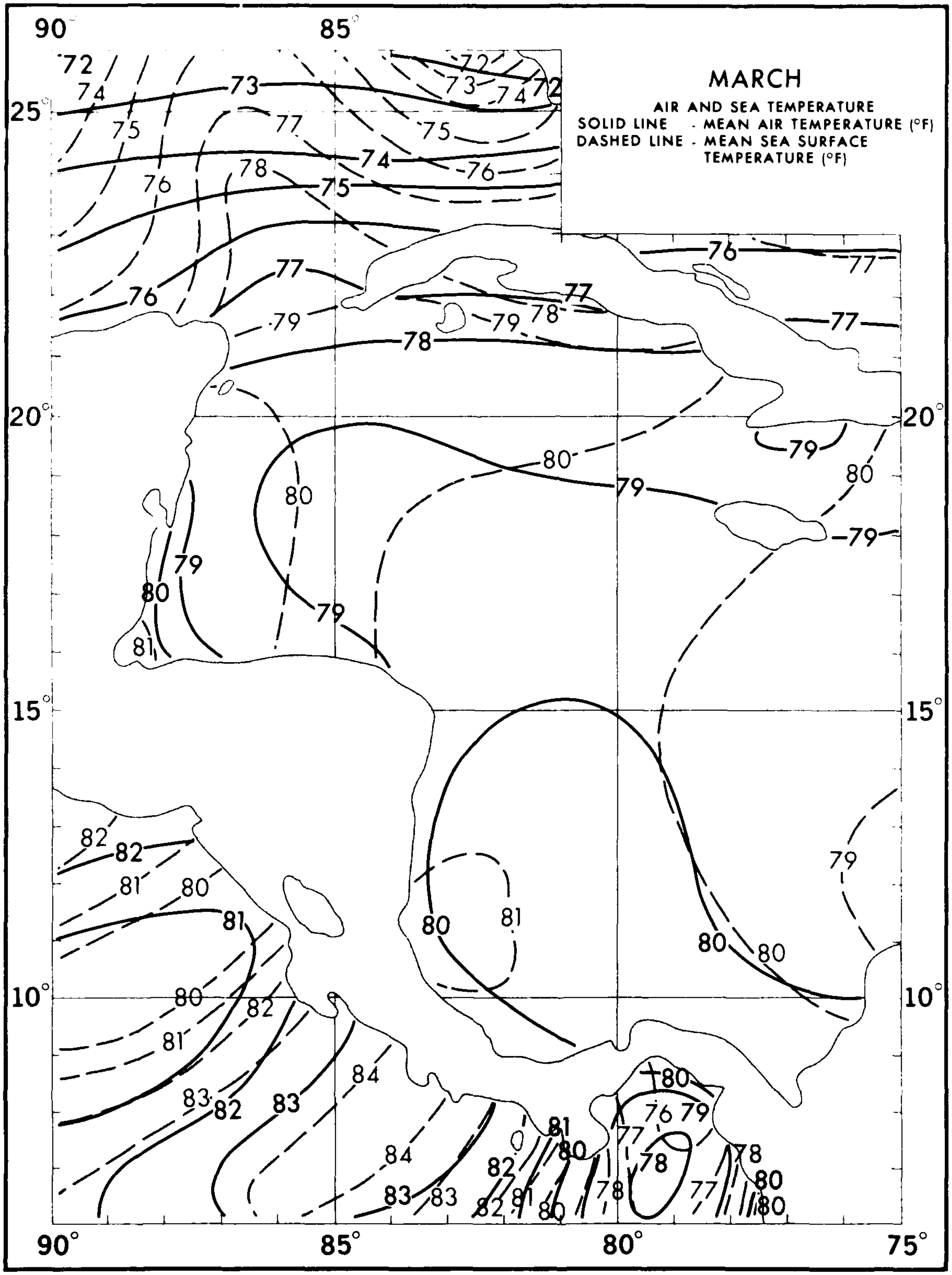

MARCH
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°

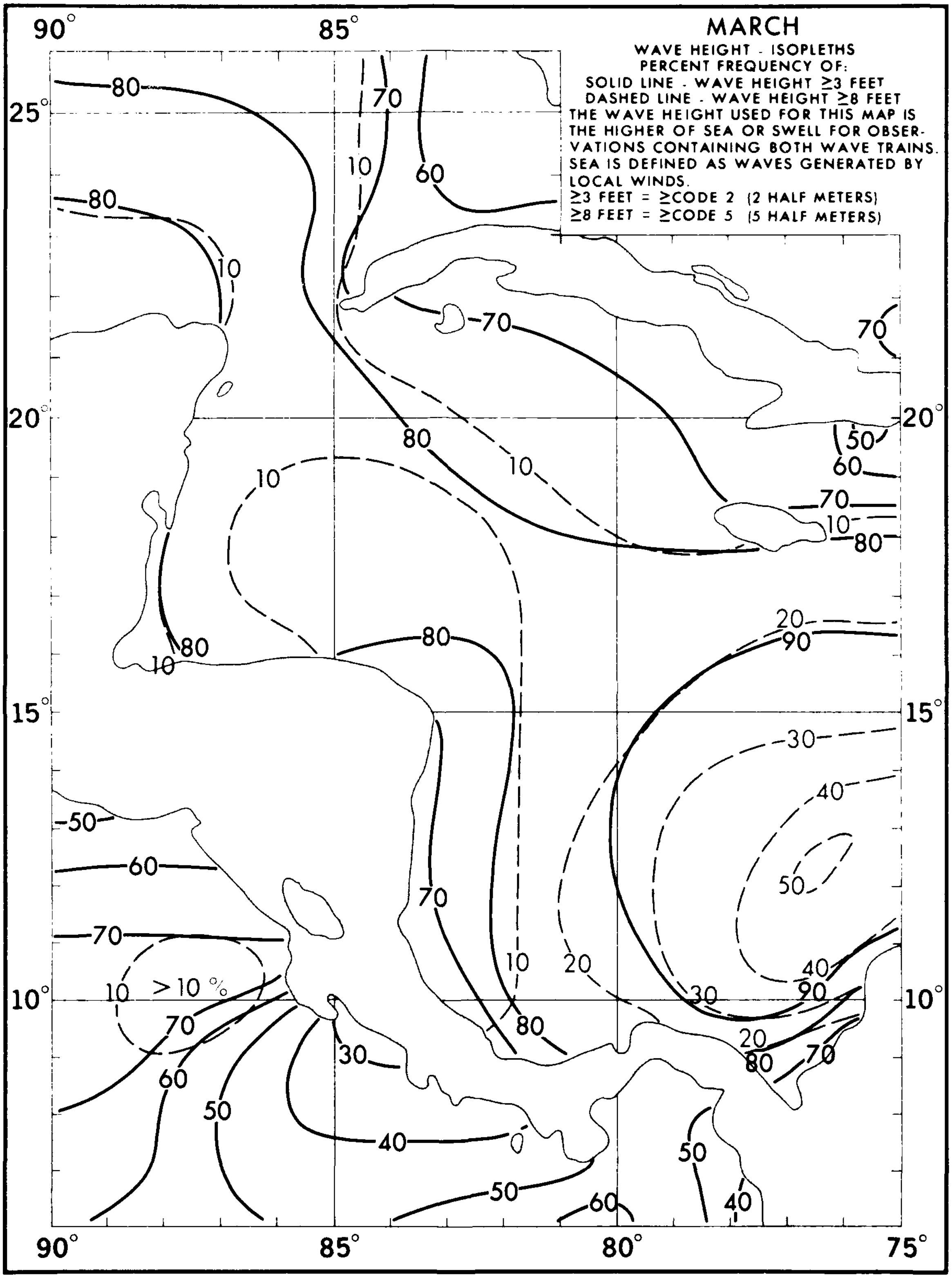

MARCH
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°

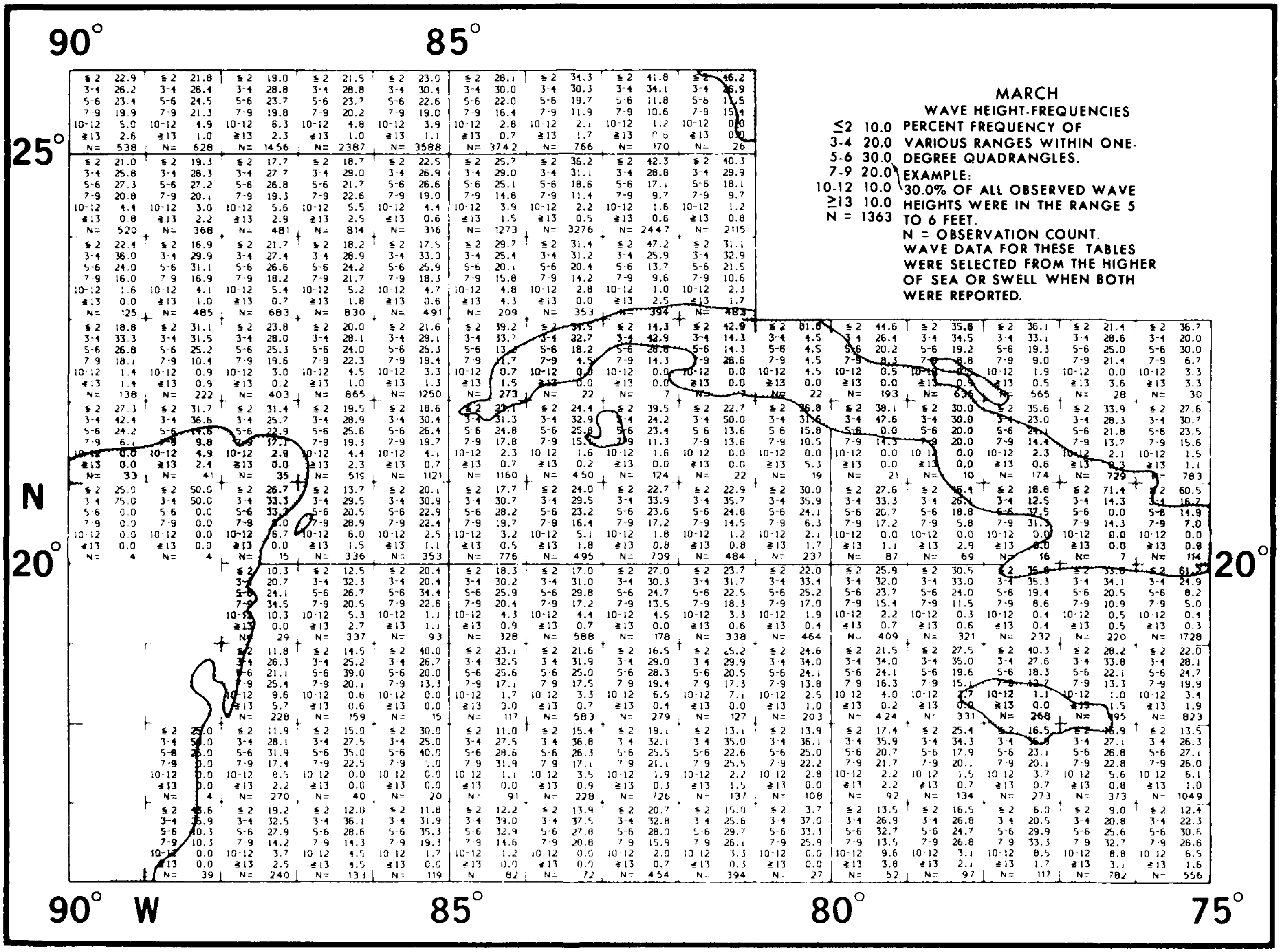


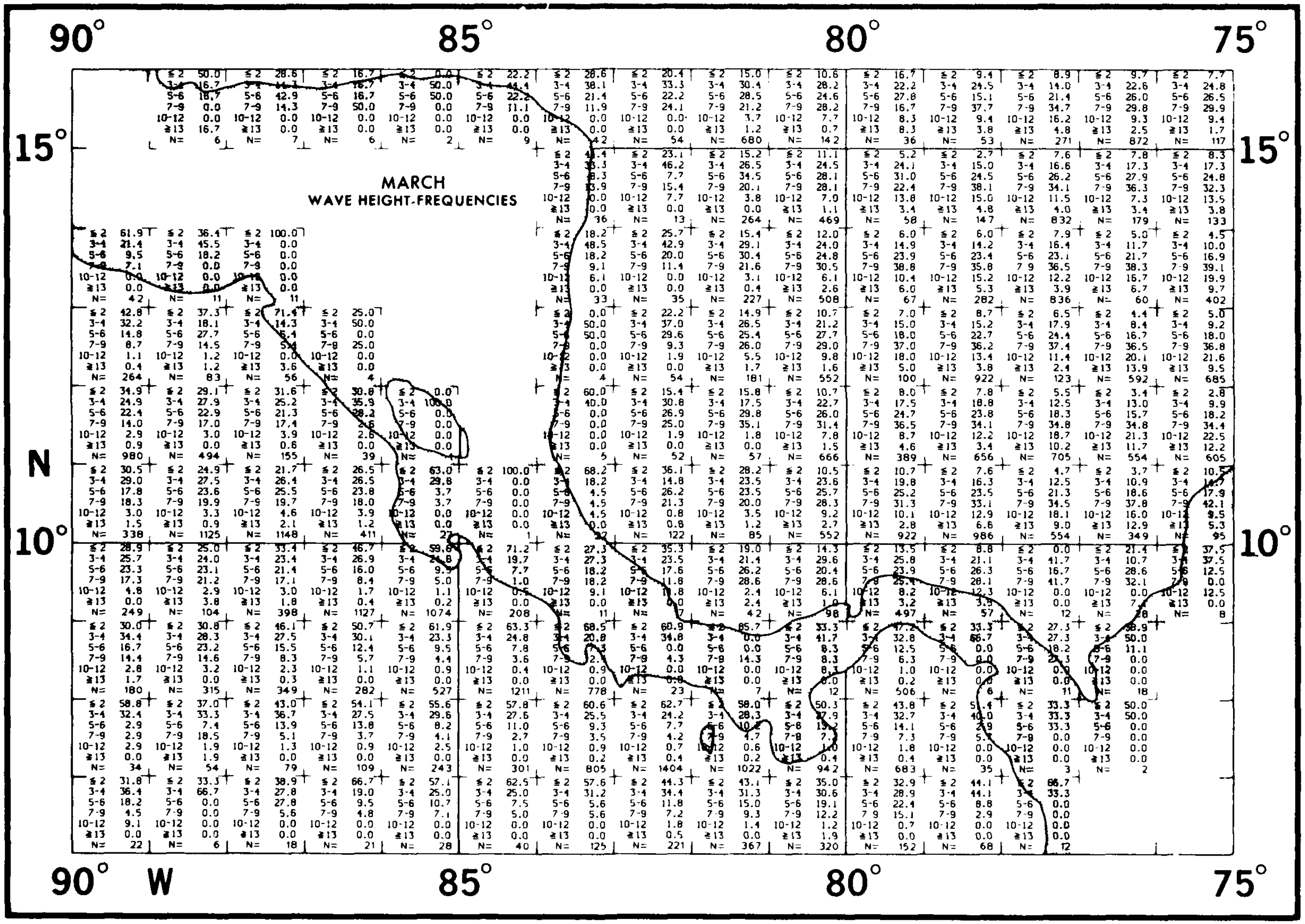
MARCH
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
80°
75°
90° W
25°
20°
N

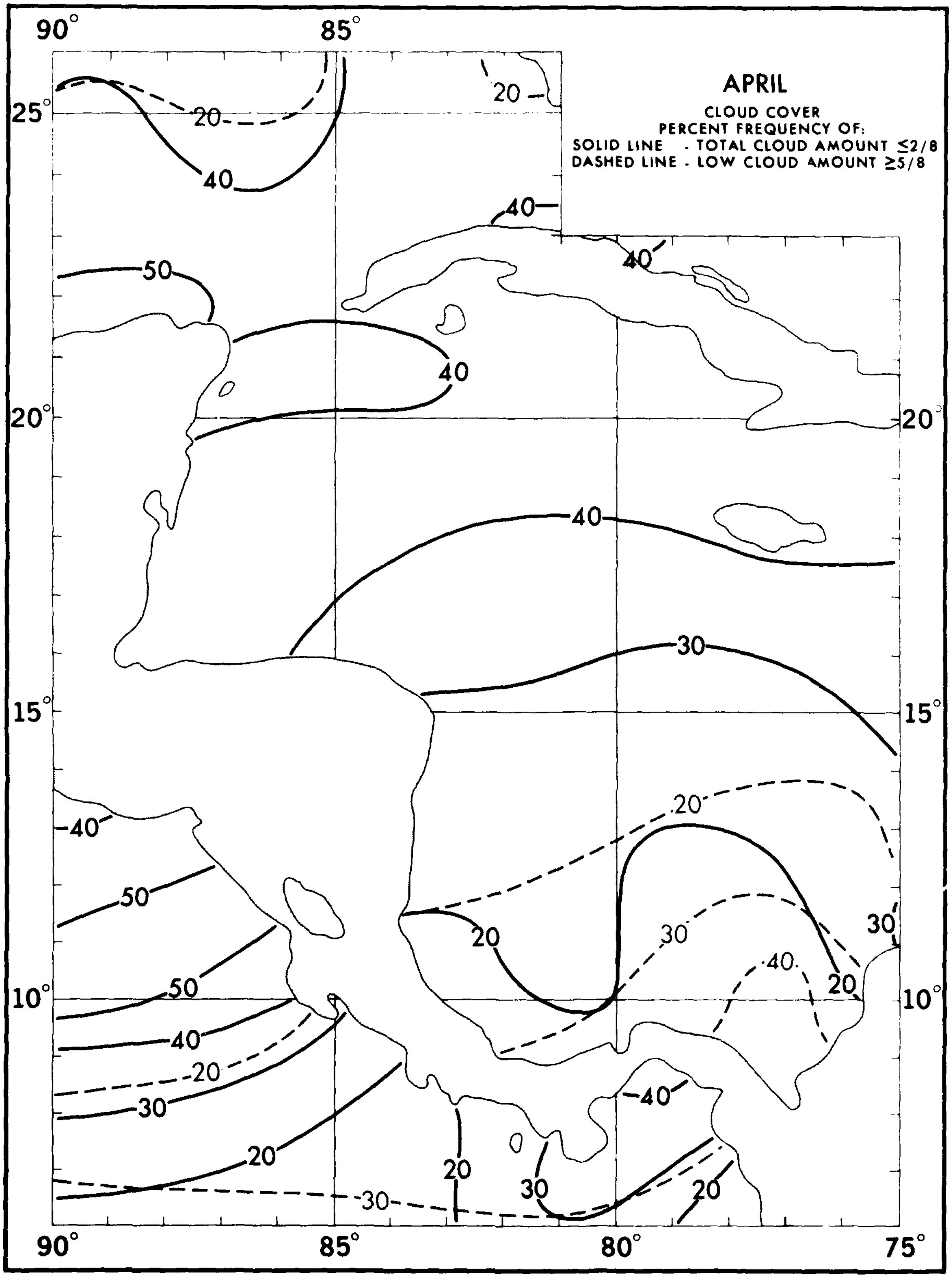

MARCH
SURFACE WIND ROSE
90°
85°
80°
75°
15°
10°
N
W


MARCH
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)

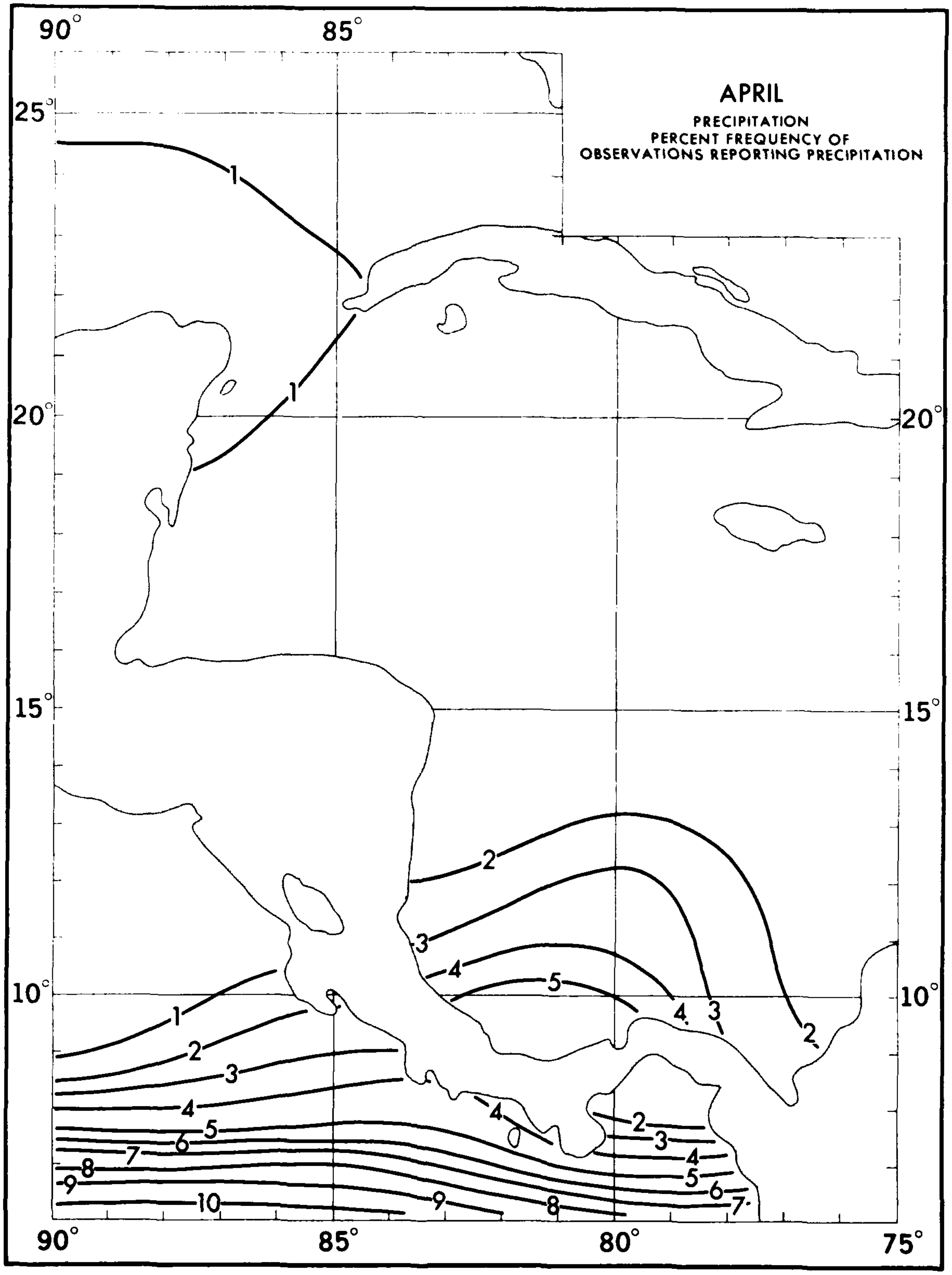

MARCH
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°
>10 %

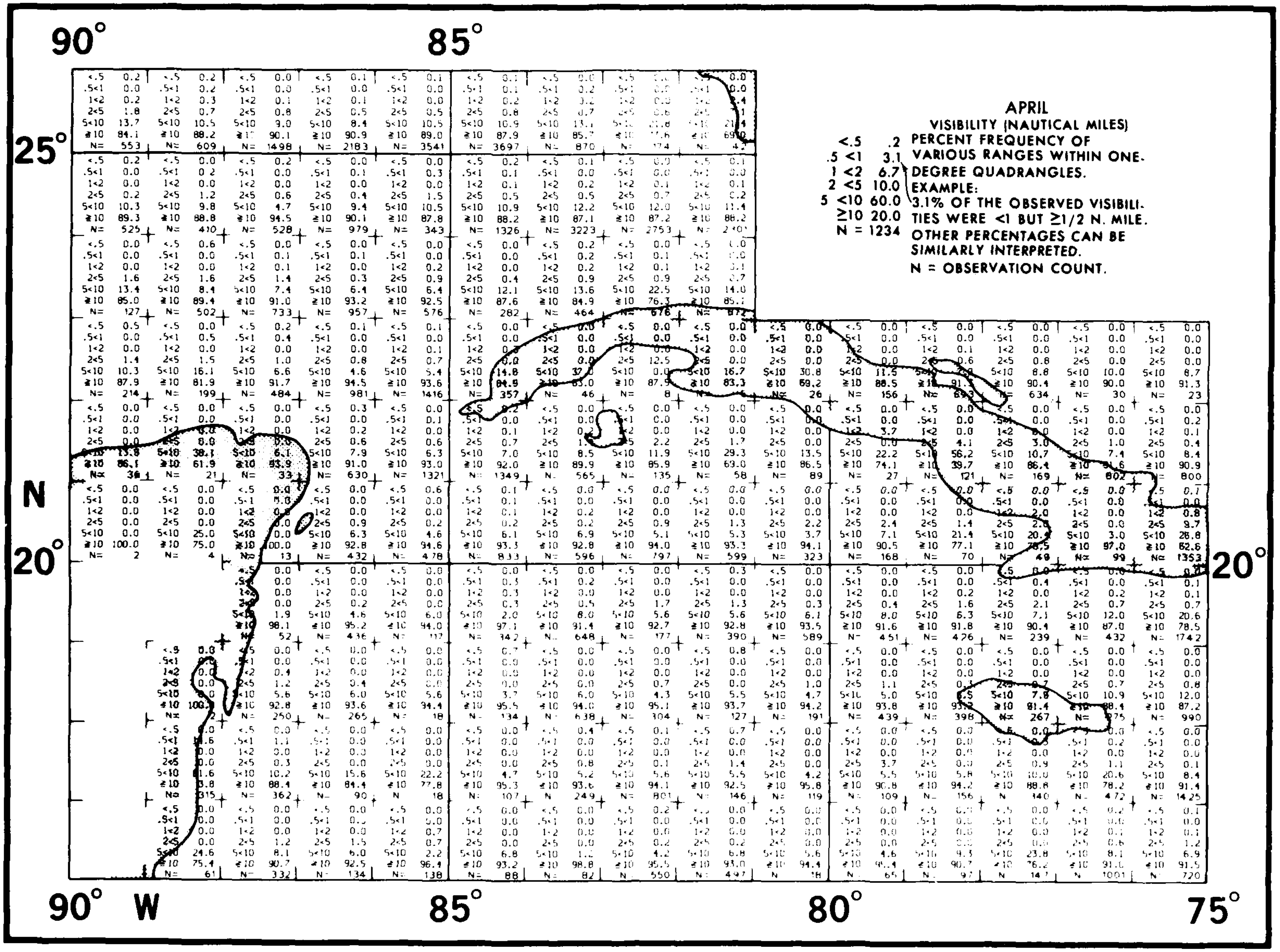

MARCH
WAVE HEIGHT-FREQUENCIES
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
90°
85°
80°
75°
90° W
25°
20°
N

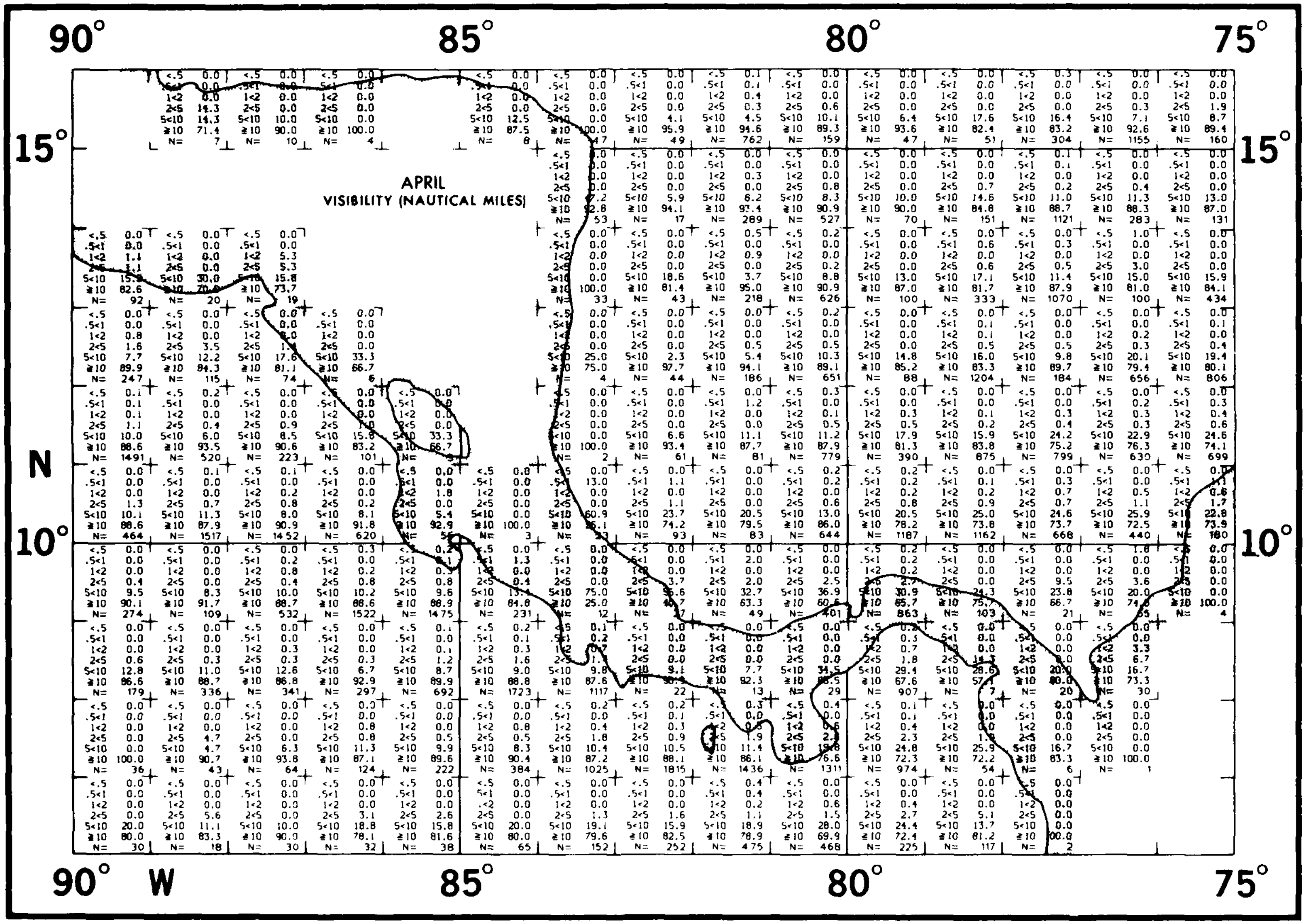

MARCH
WAVE HEIGHT-FREQUENCIES
90°
85°
80°
75°
15°
10°
N
W

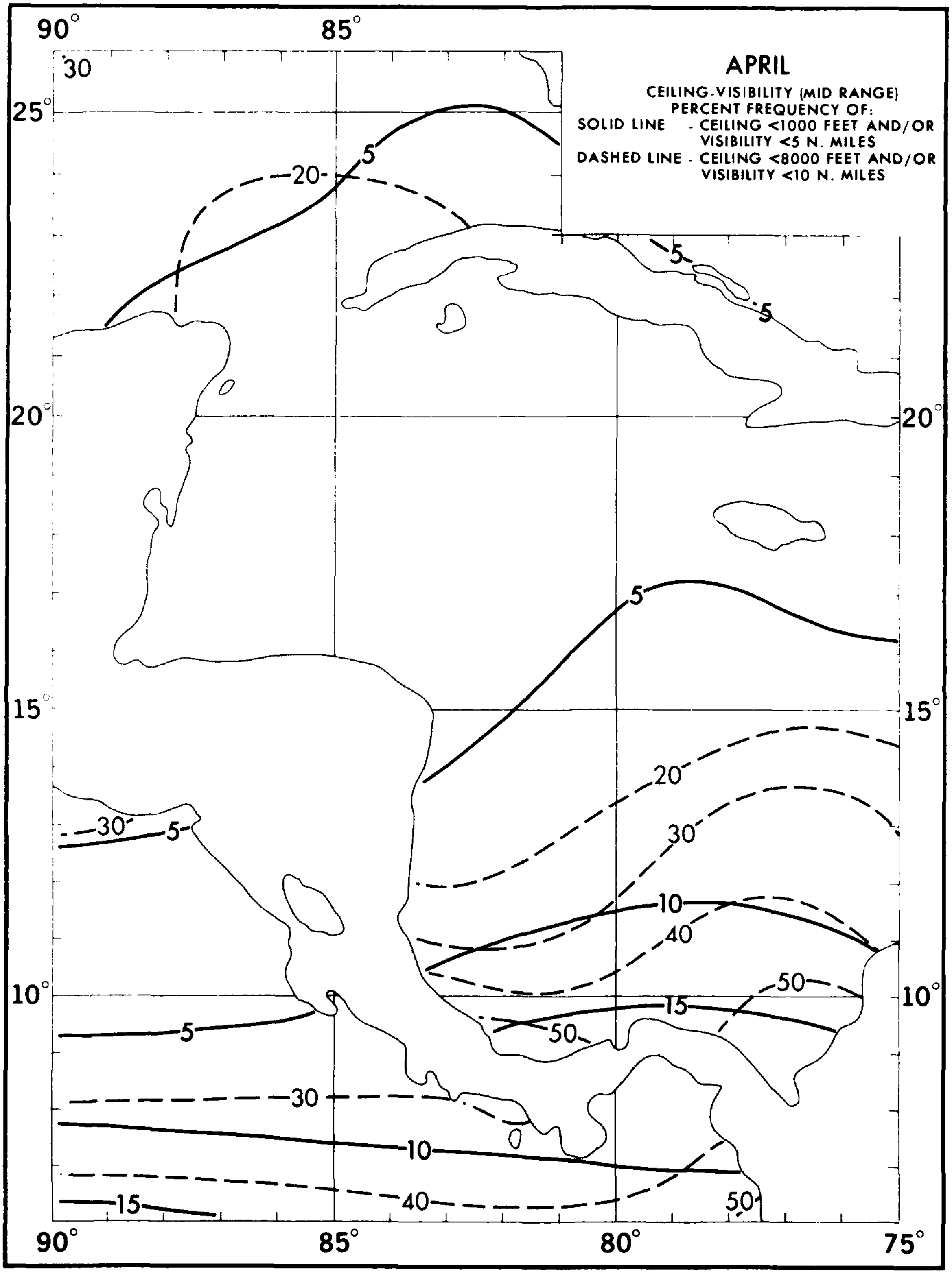


APRIL
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°

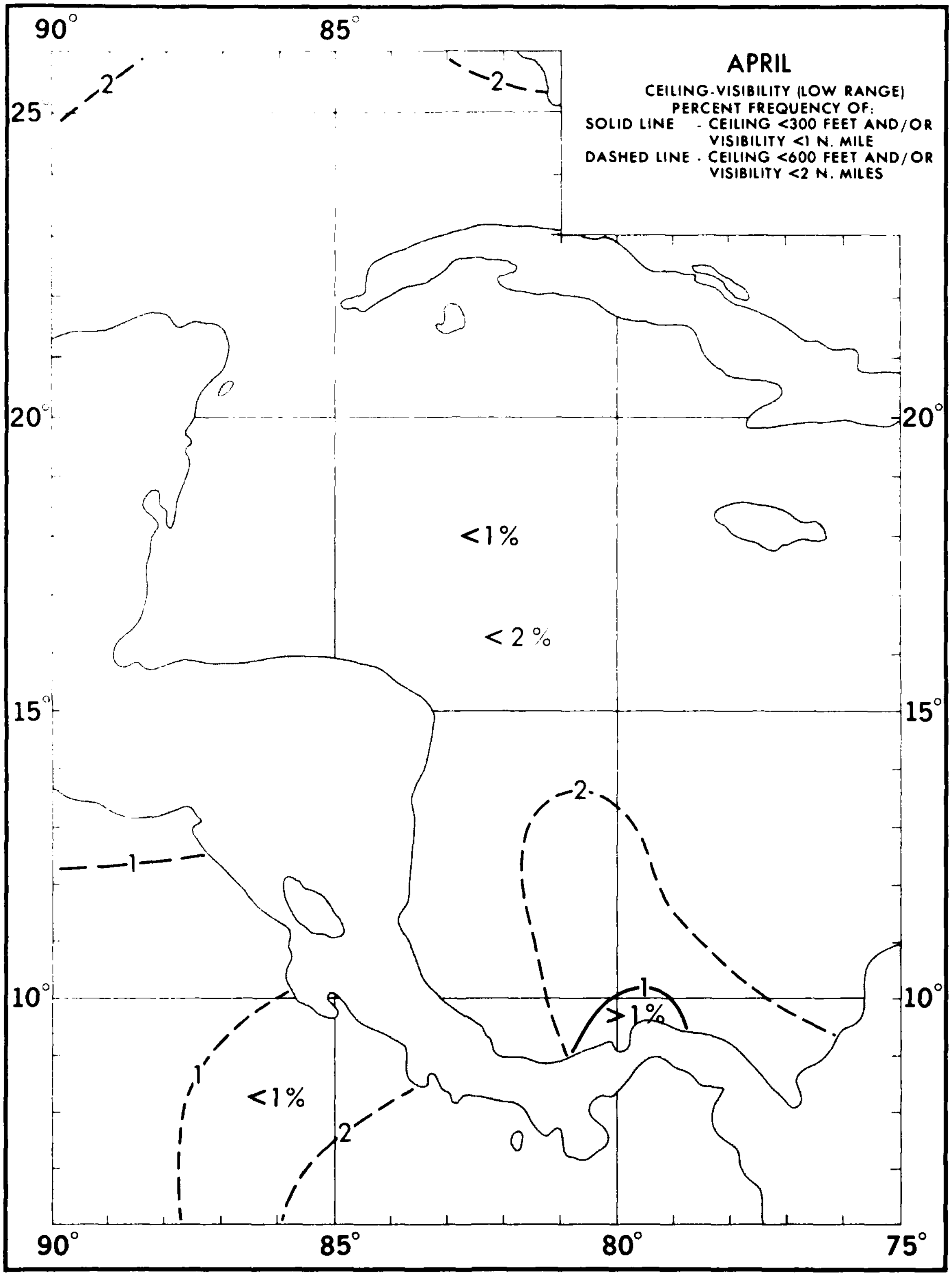

APRIL
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°

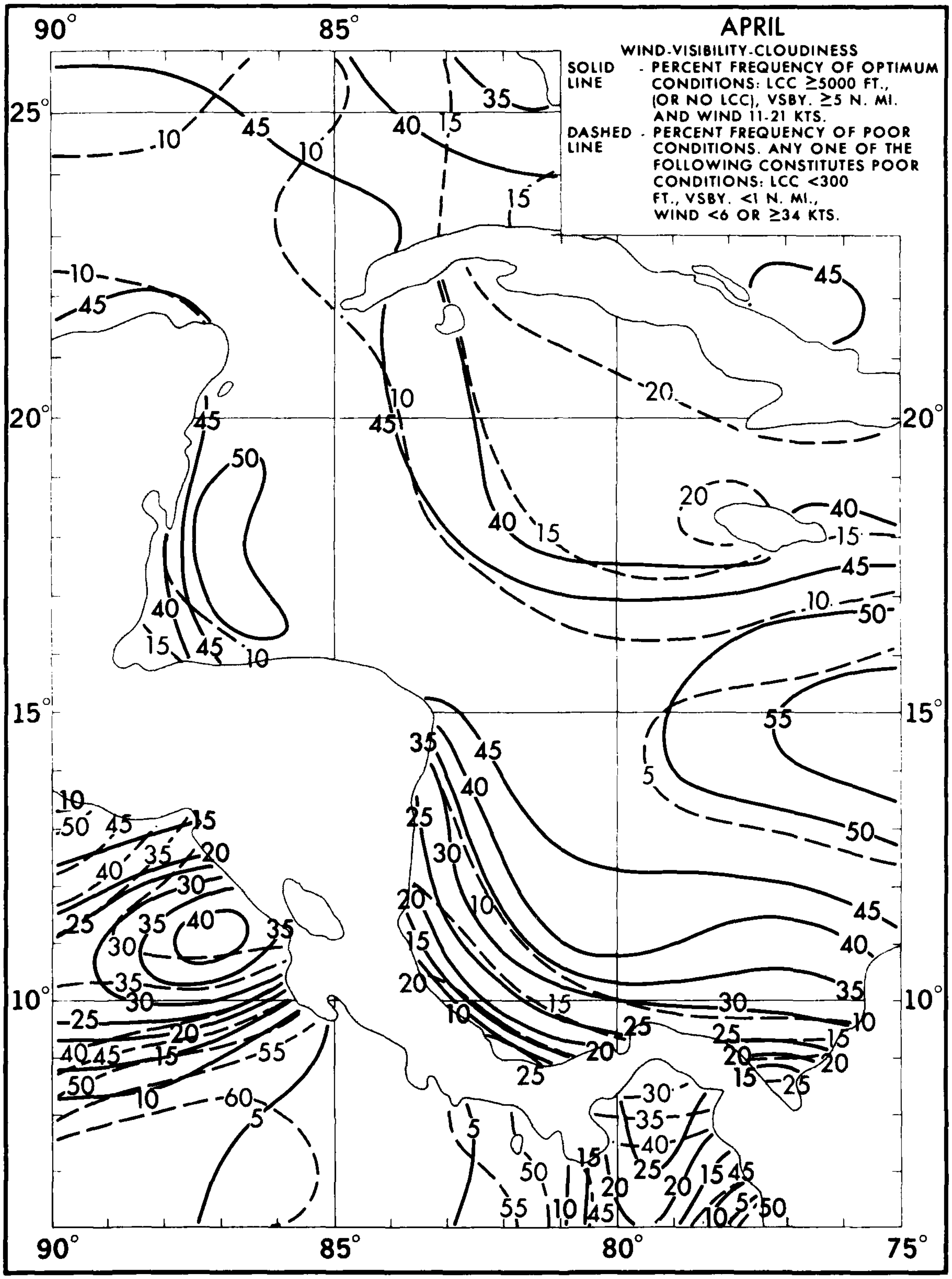

90°
85°
25°
N
20°
90° W
85°
80°
75°
20°
APRIL
VISIBILITY (NAUTICAL MILES)
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.

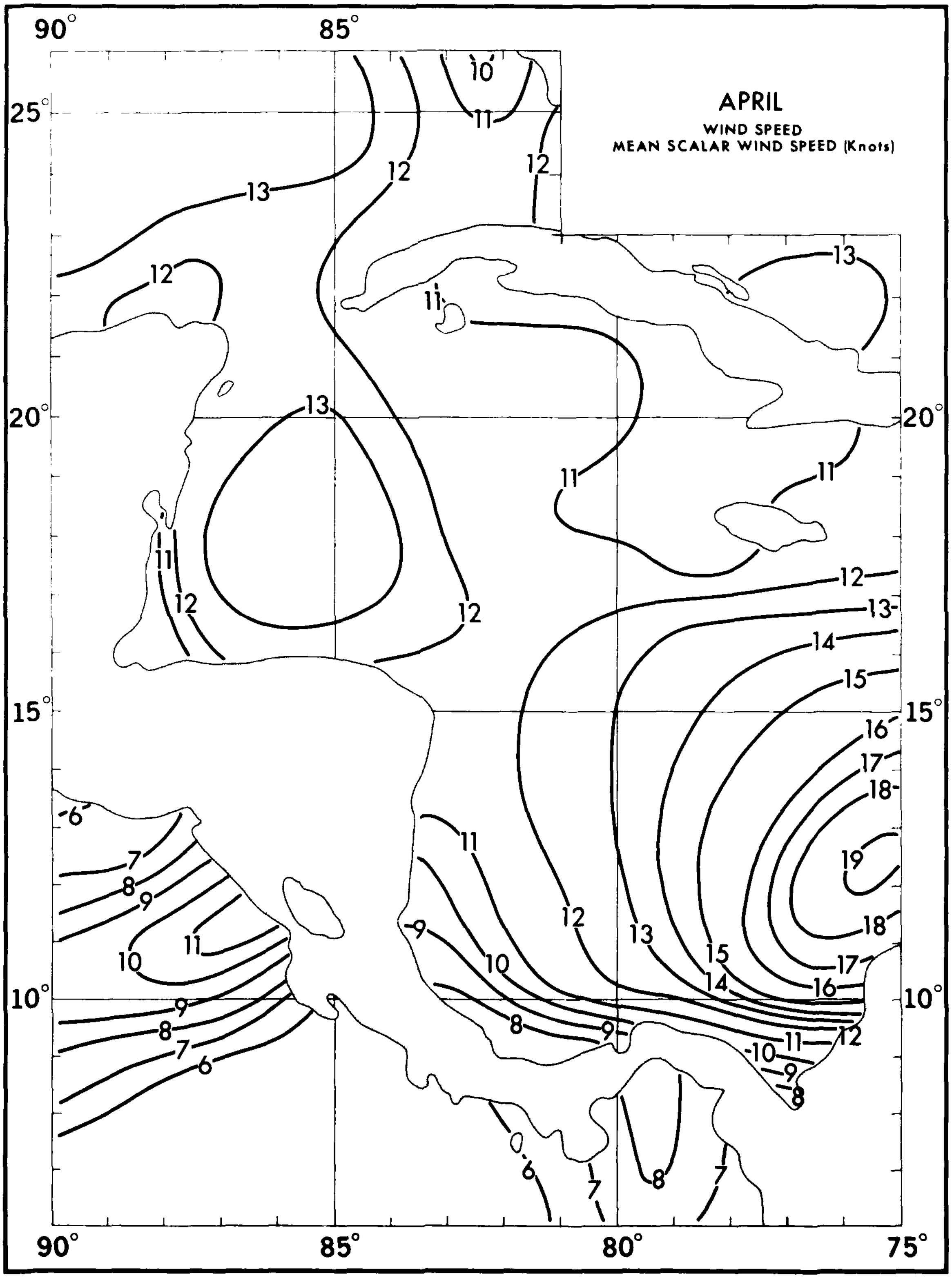

APRIL
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
N
10°
W

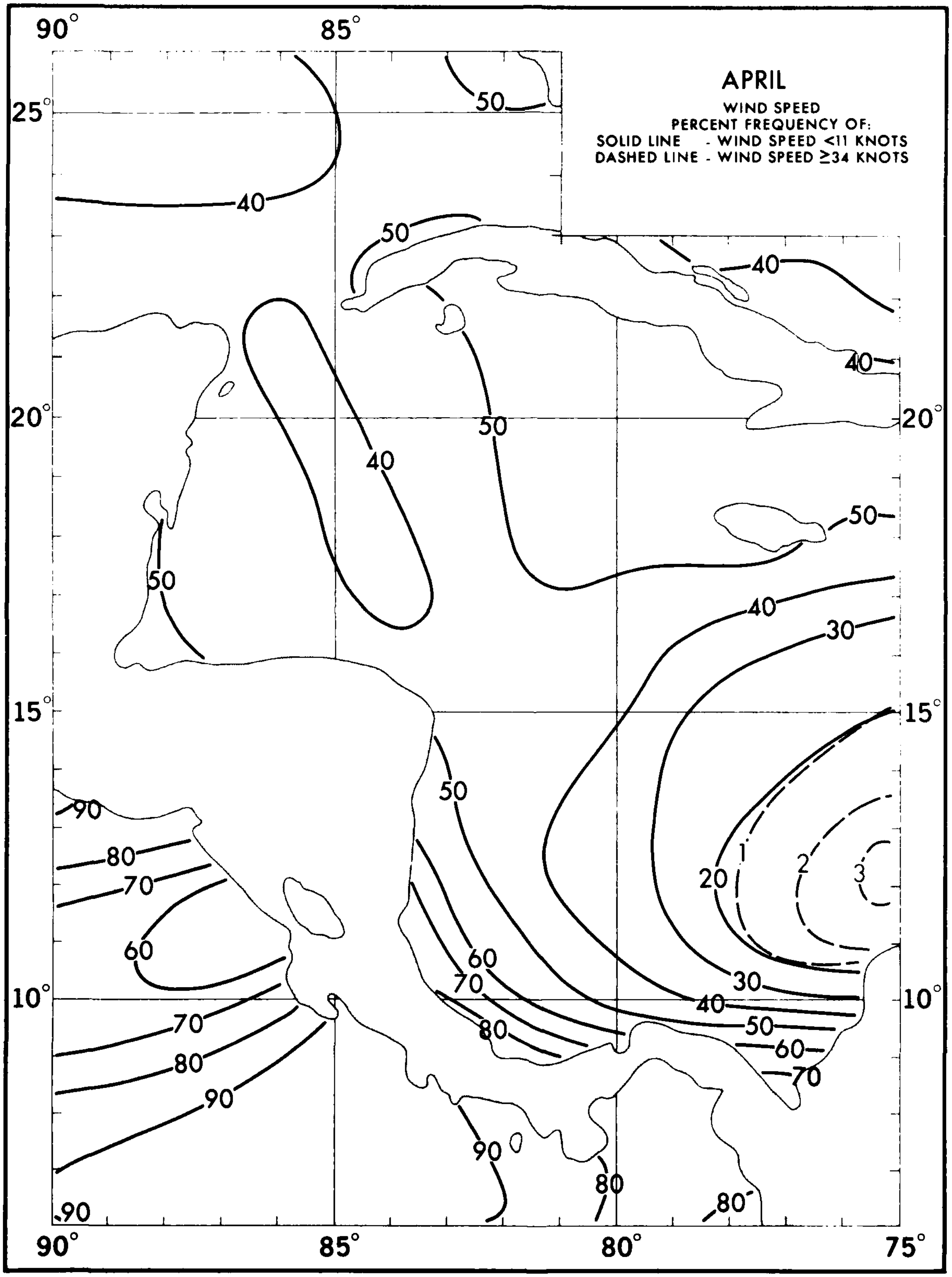


APRIL
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
30
25°
20°
15°
10°
5
20
10
30
40
50
15

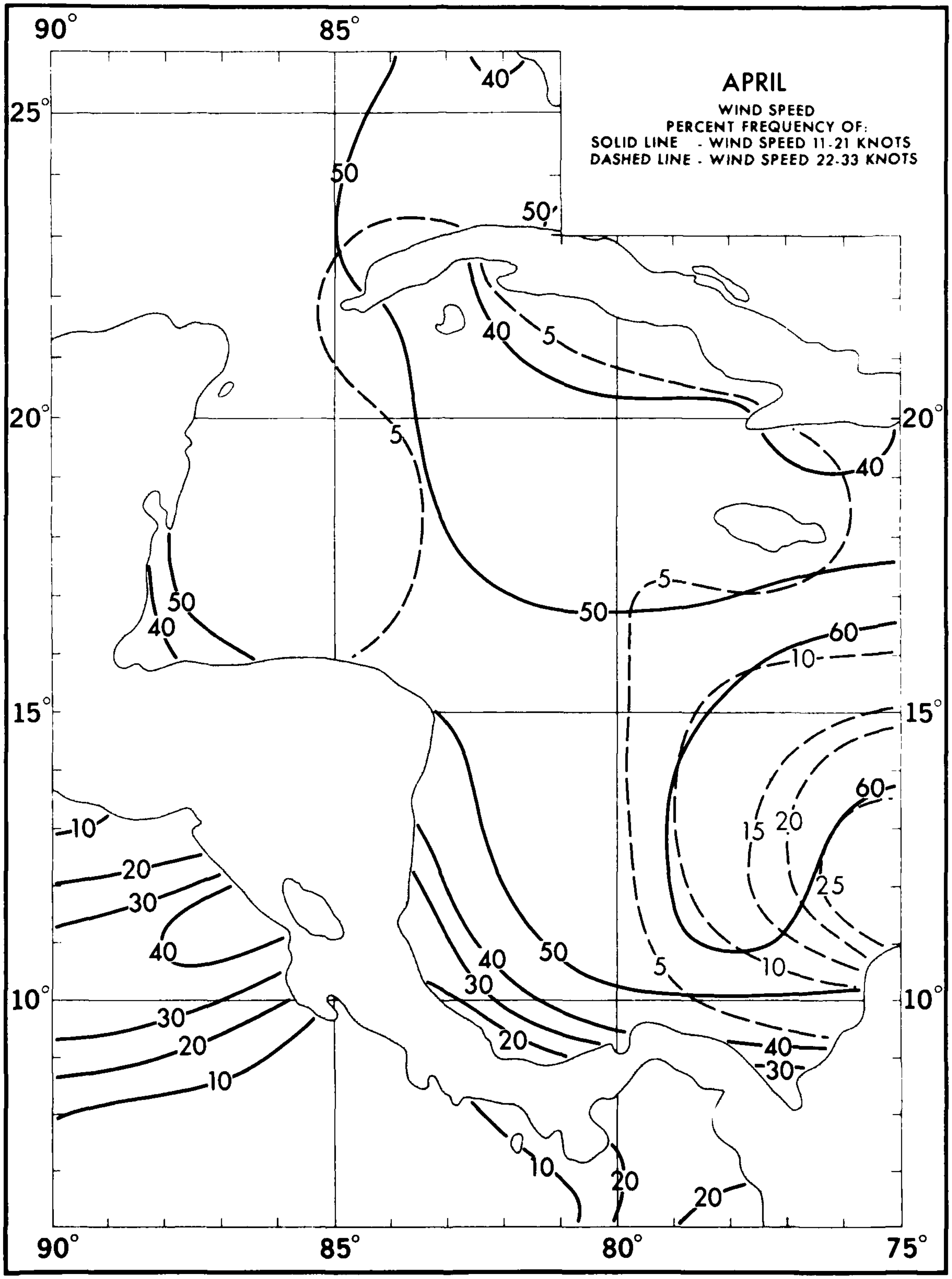

APRIL
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
2
1
<1%
< 2 %
>1%

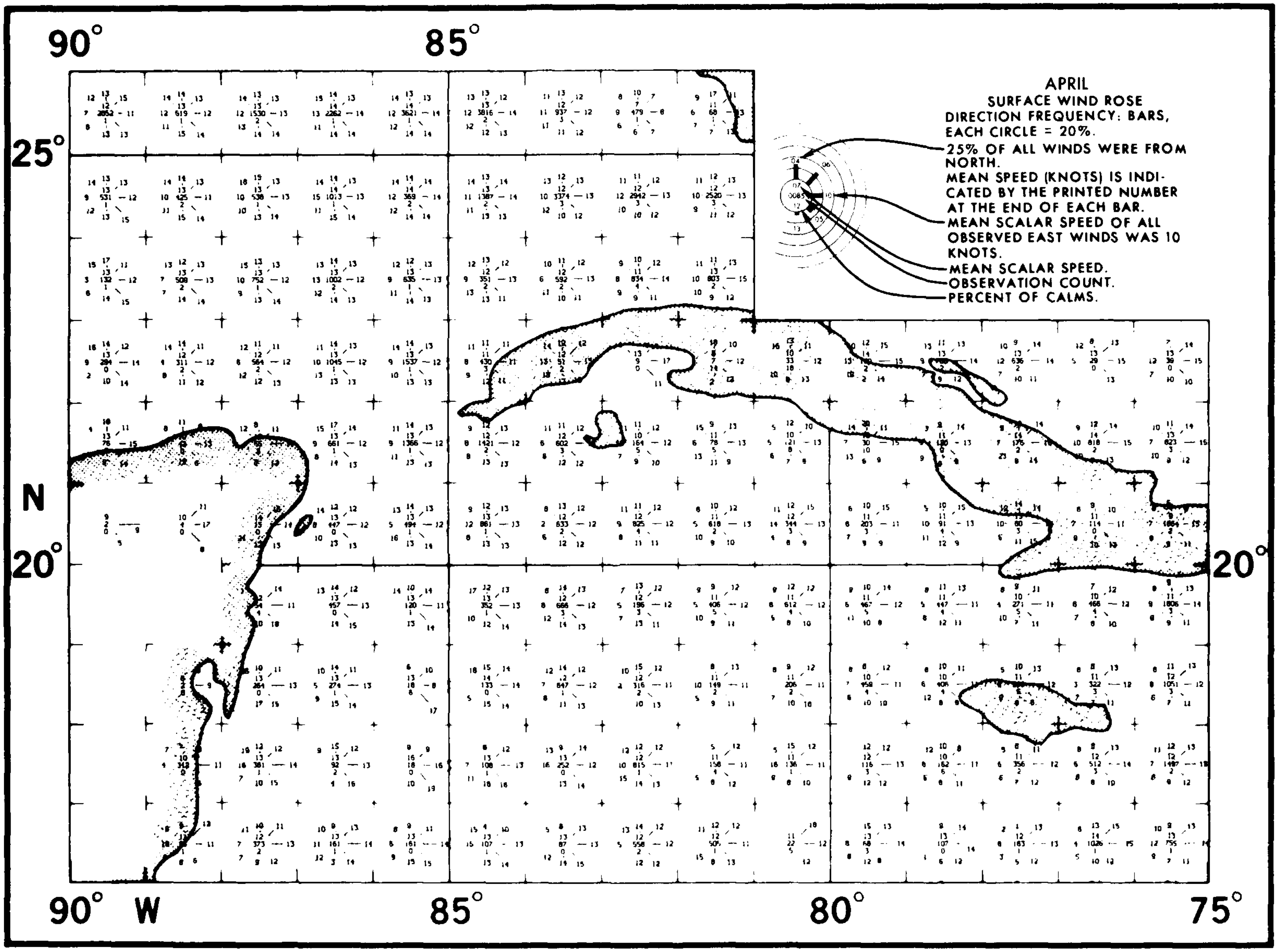

APRIL
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°


APRIL
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°
13
12
11
10
14
15
16
17
18
19
9
8
7
6

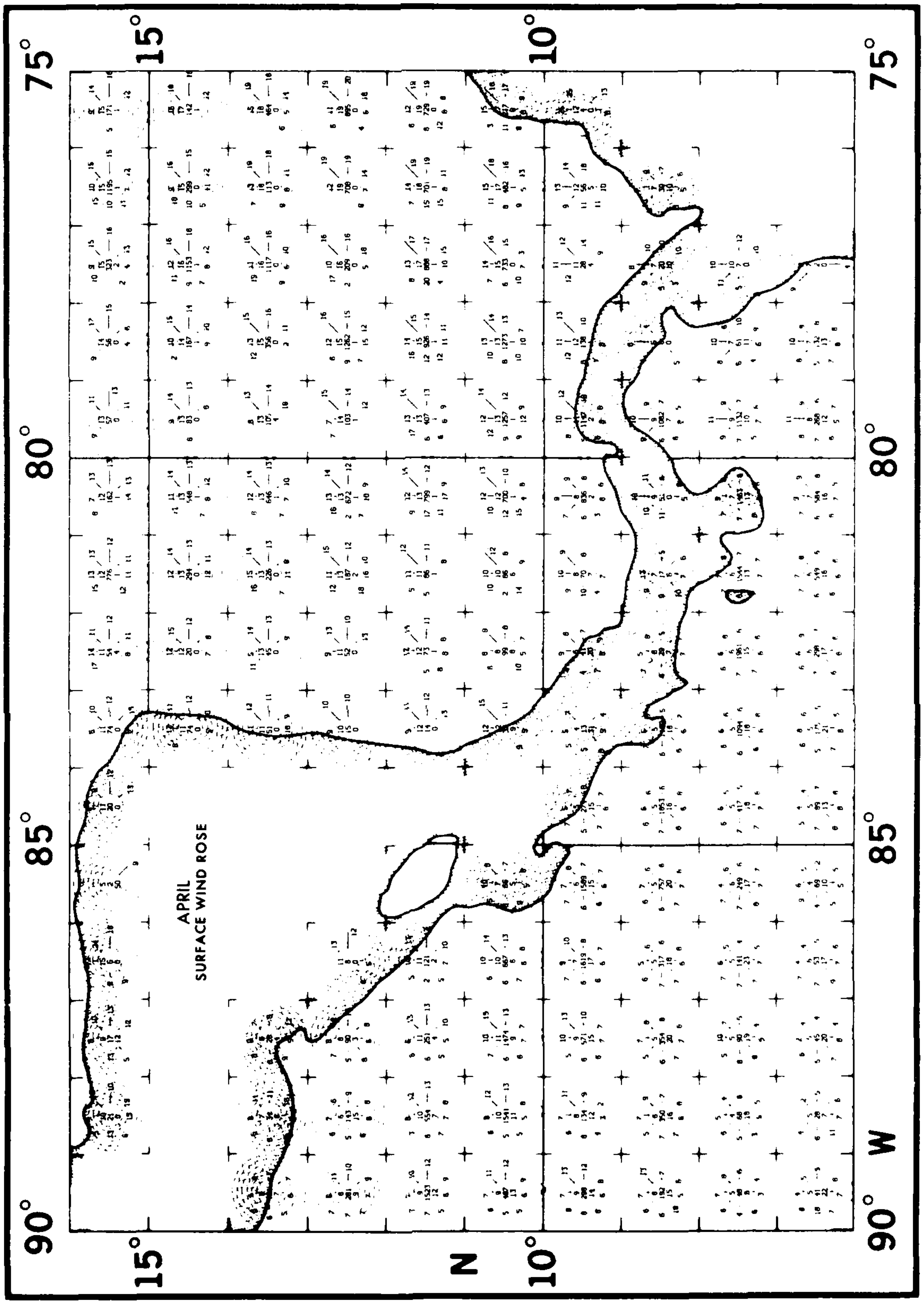


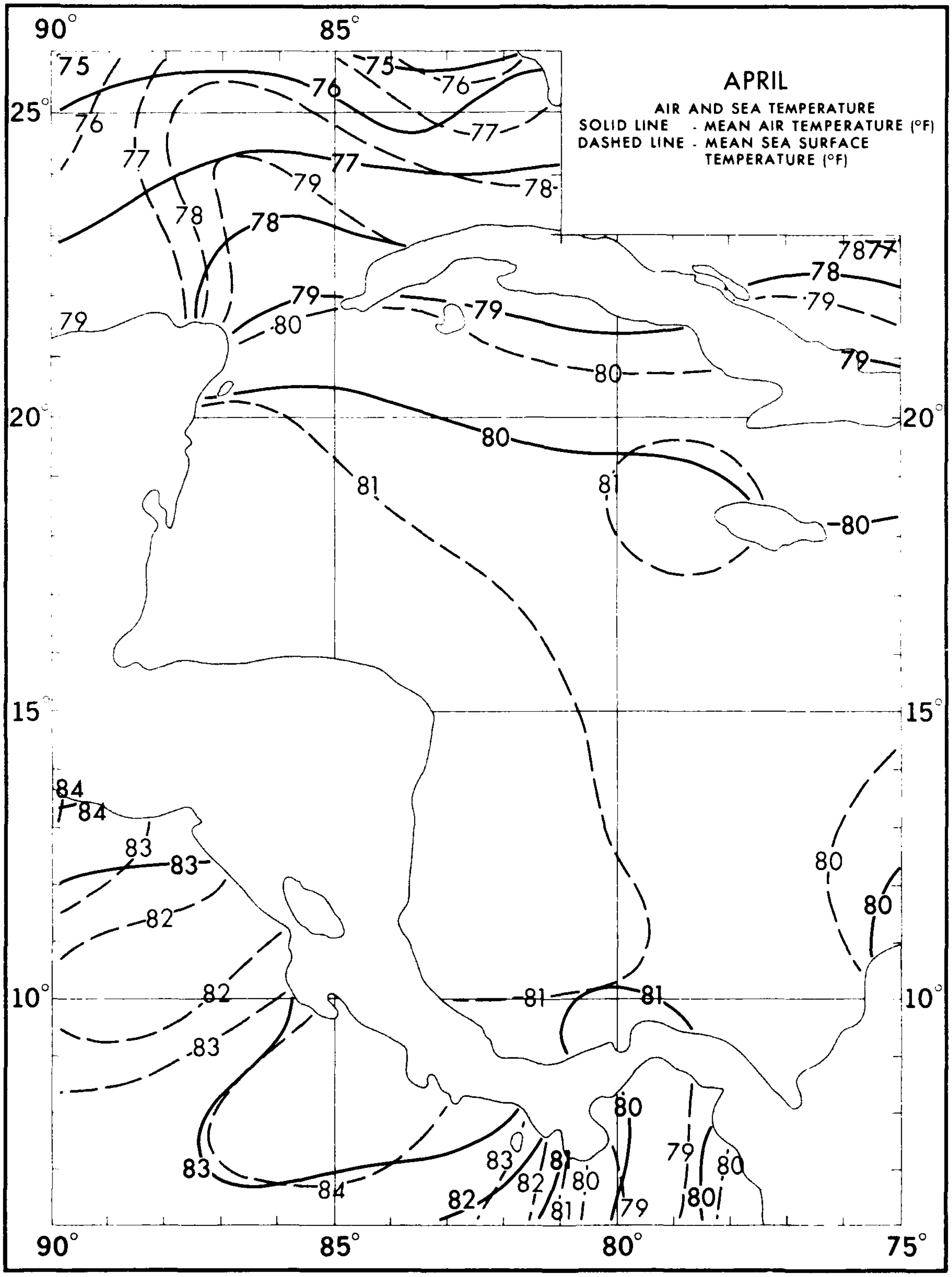
APRIL
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°

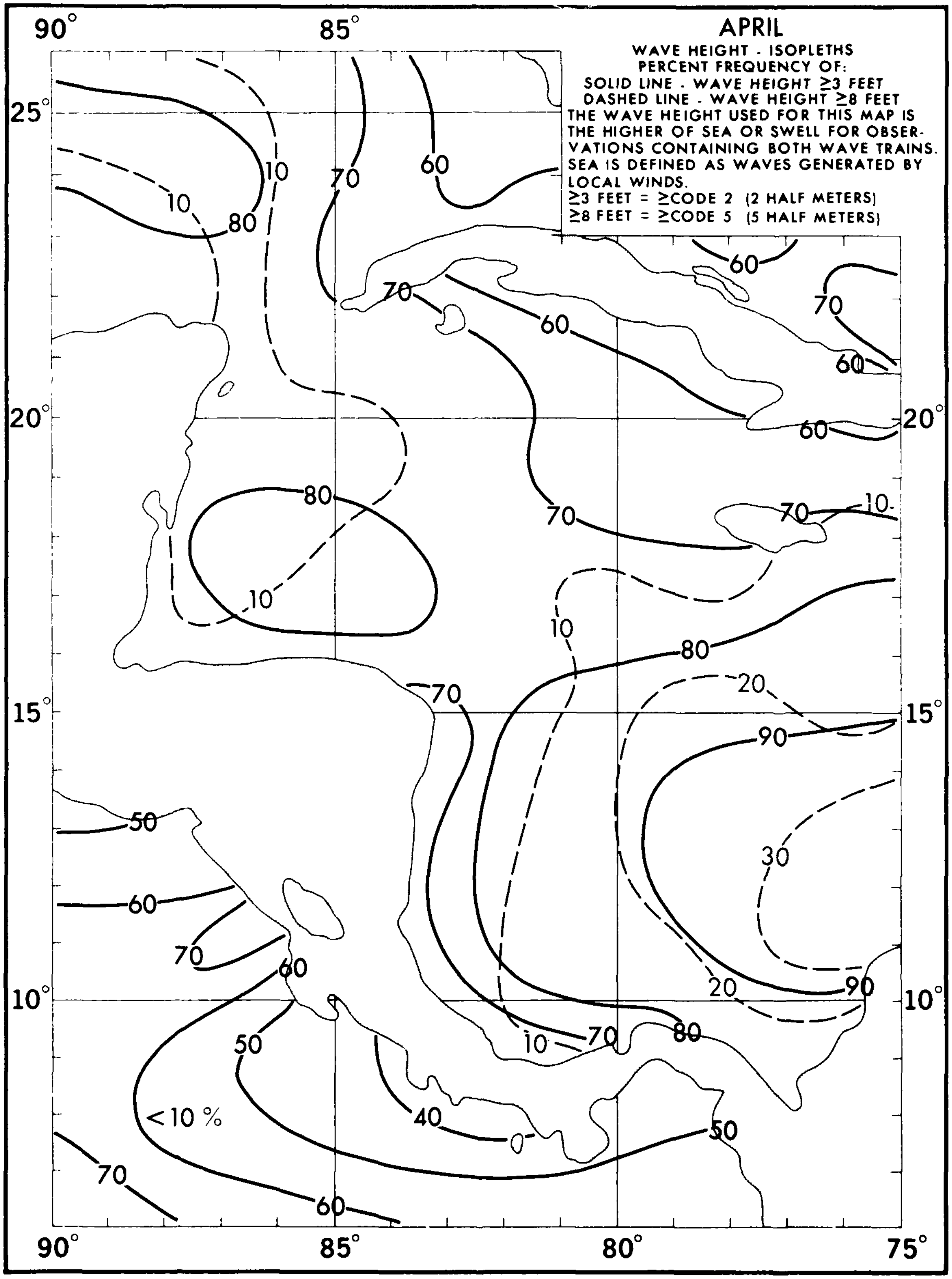

APRIL
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°

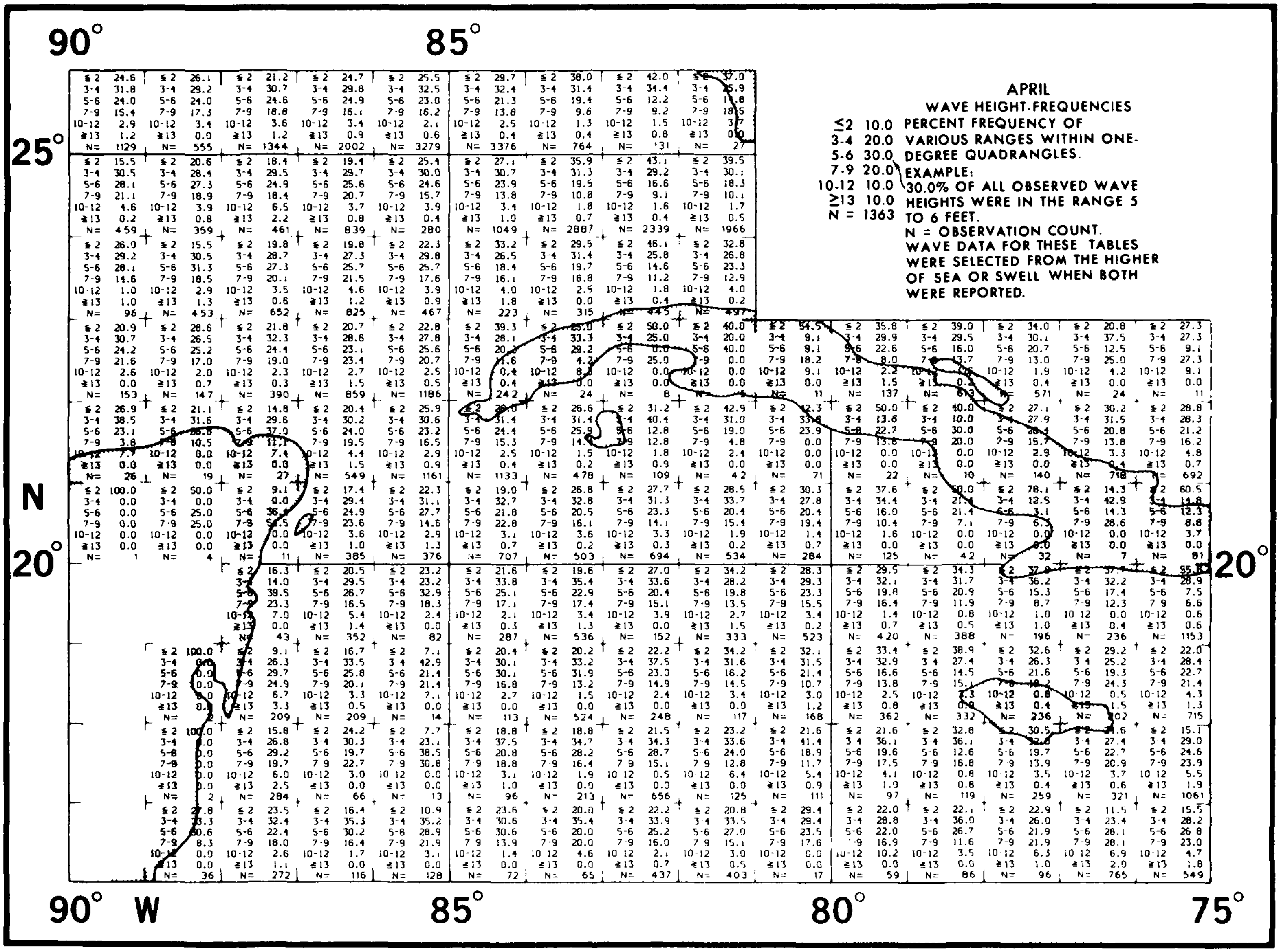


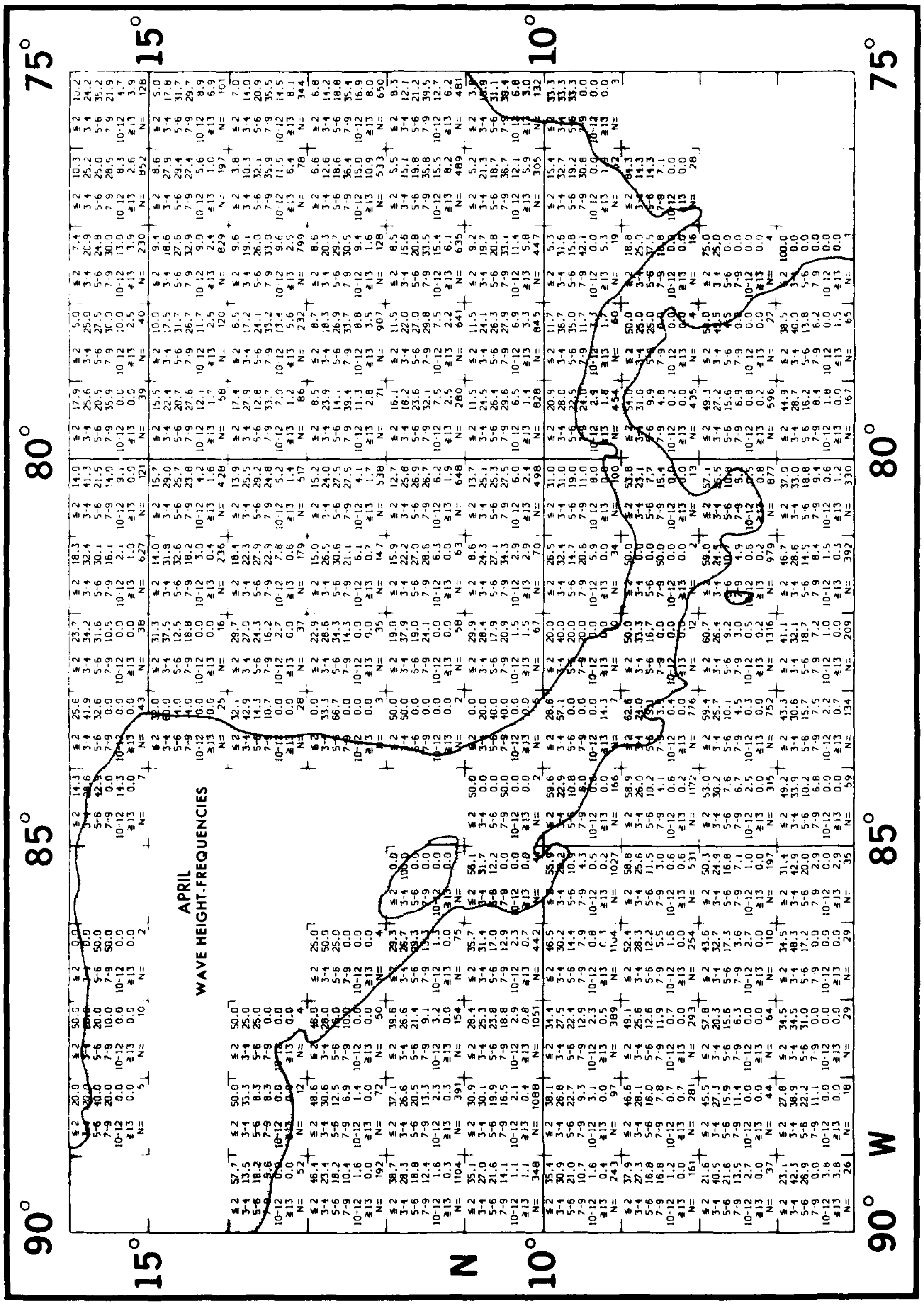
APRIL
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
25°
N
20°
20°
90° W
85°
80°
75°

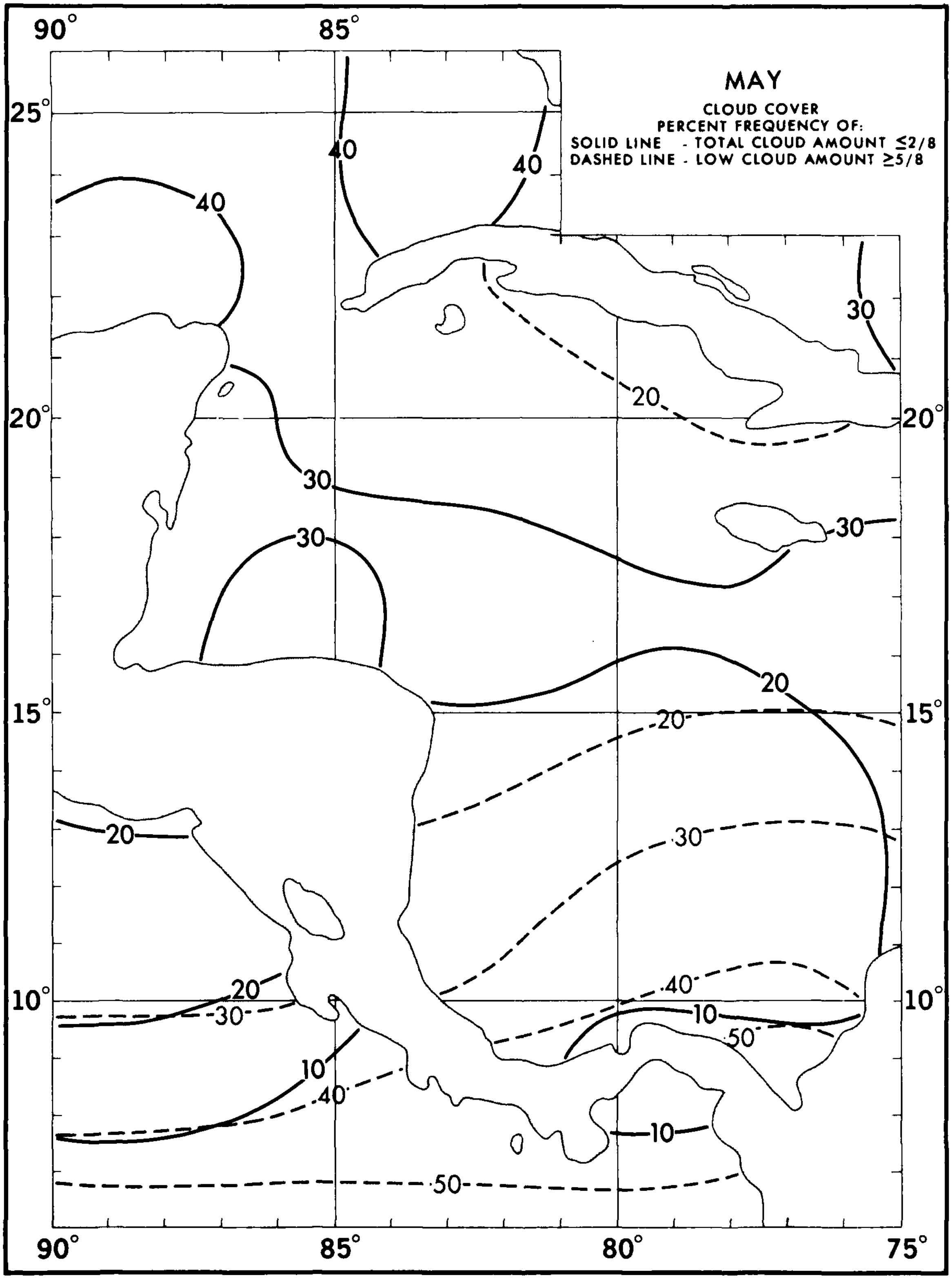

APRIL
SURFACE WIND ROSE
75°
80°
85°
90°
15°
10°
N
W

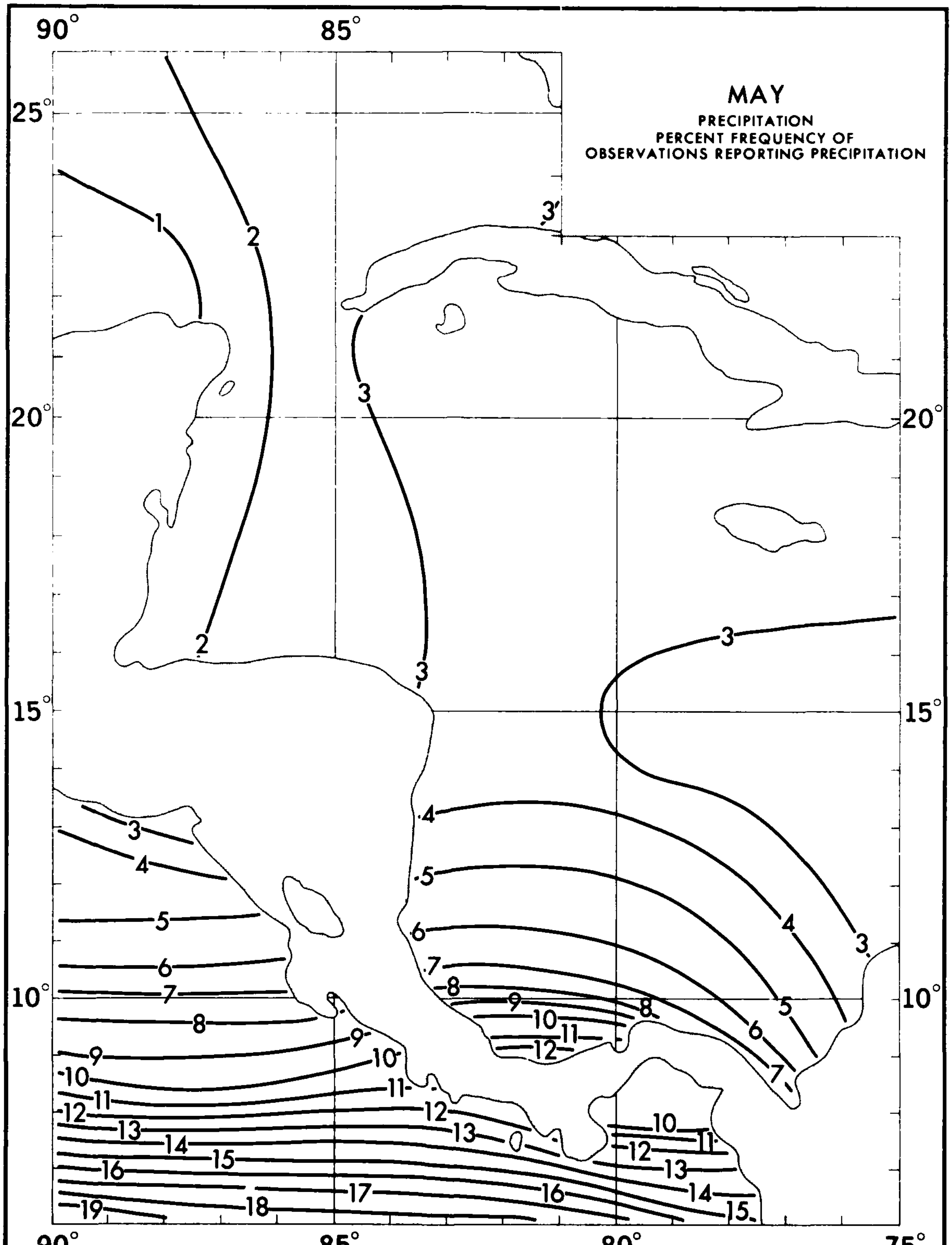

APRIL
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°

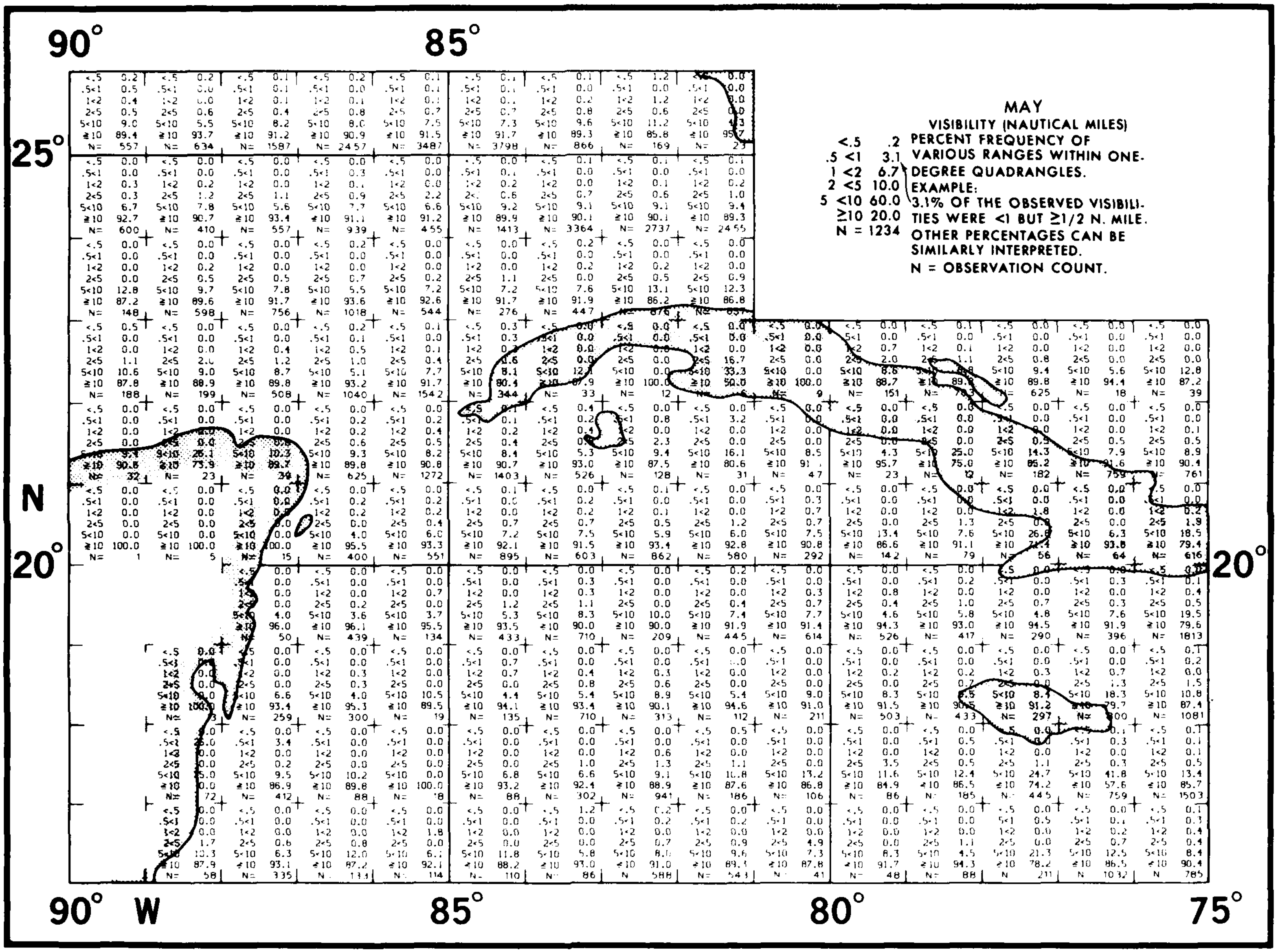

APRIL
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°
<10 %

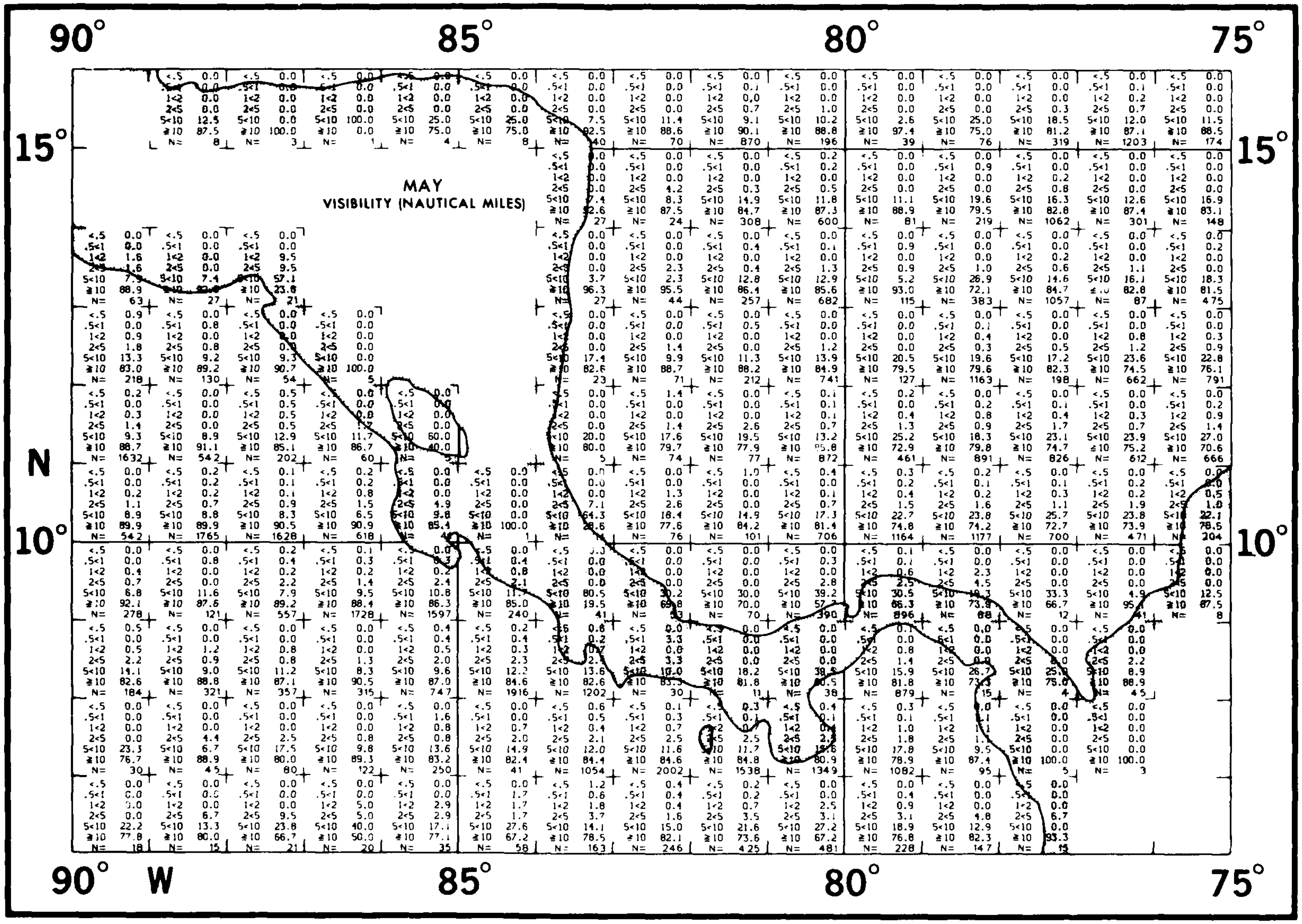

APRIL
WAVE HEIGHT-FREQUENCIES
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
90°
85°
80°
75°
W
25°
N
20°
20°

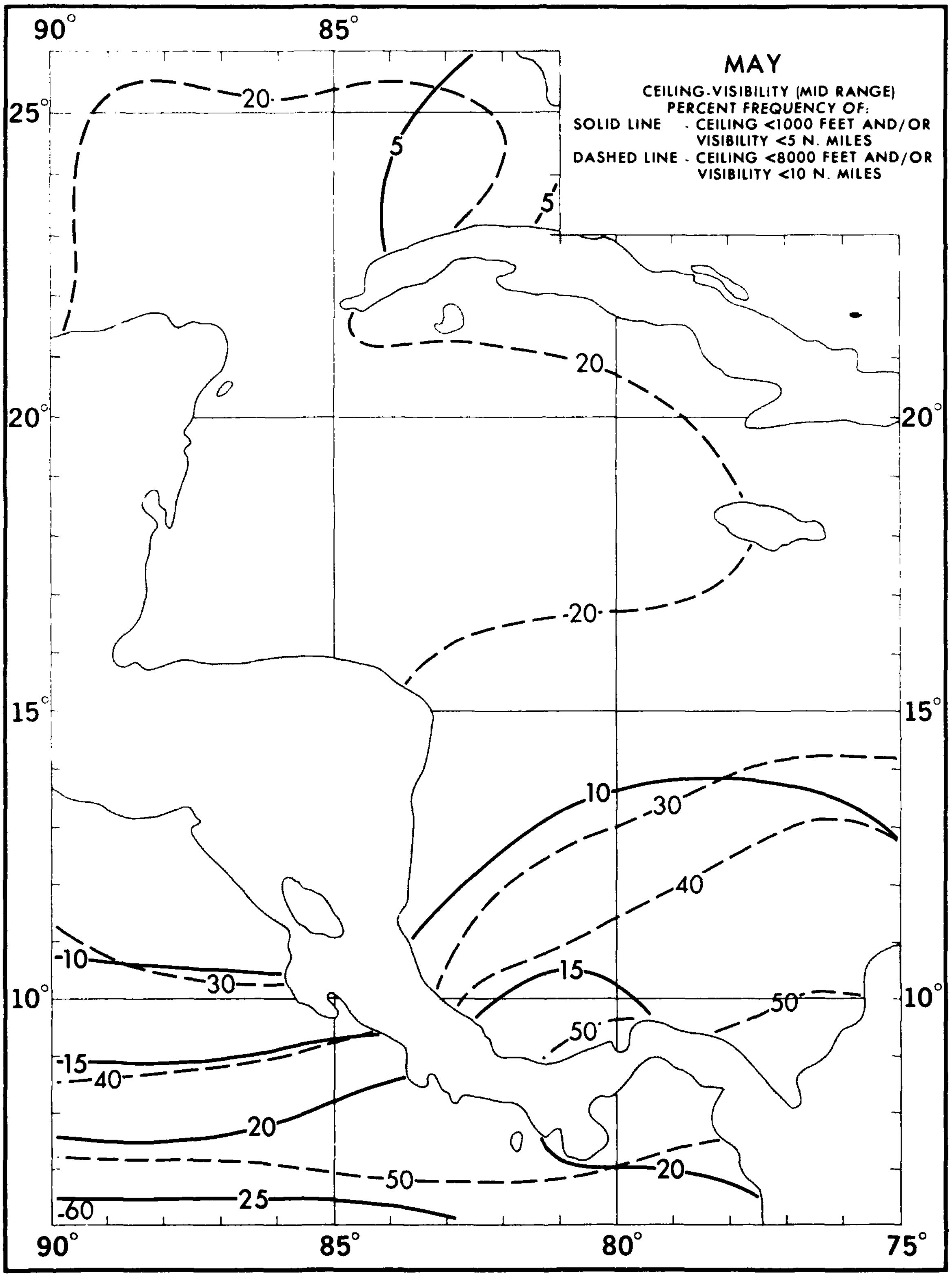

APRIL
WAVE HEIGHT-FREQUENCIES
90°
85°
80°
75°
15°
10°
N
W


MAY
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°
40
30
20
10
50

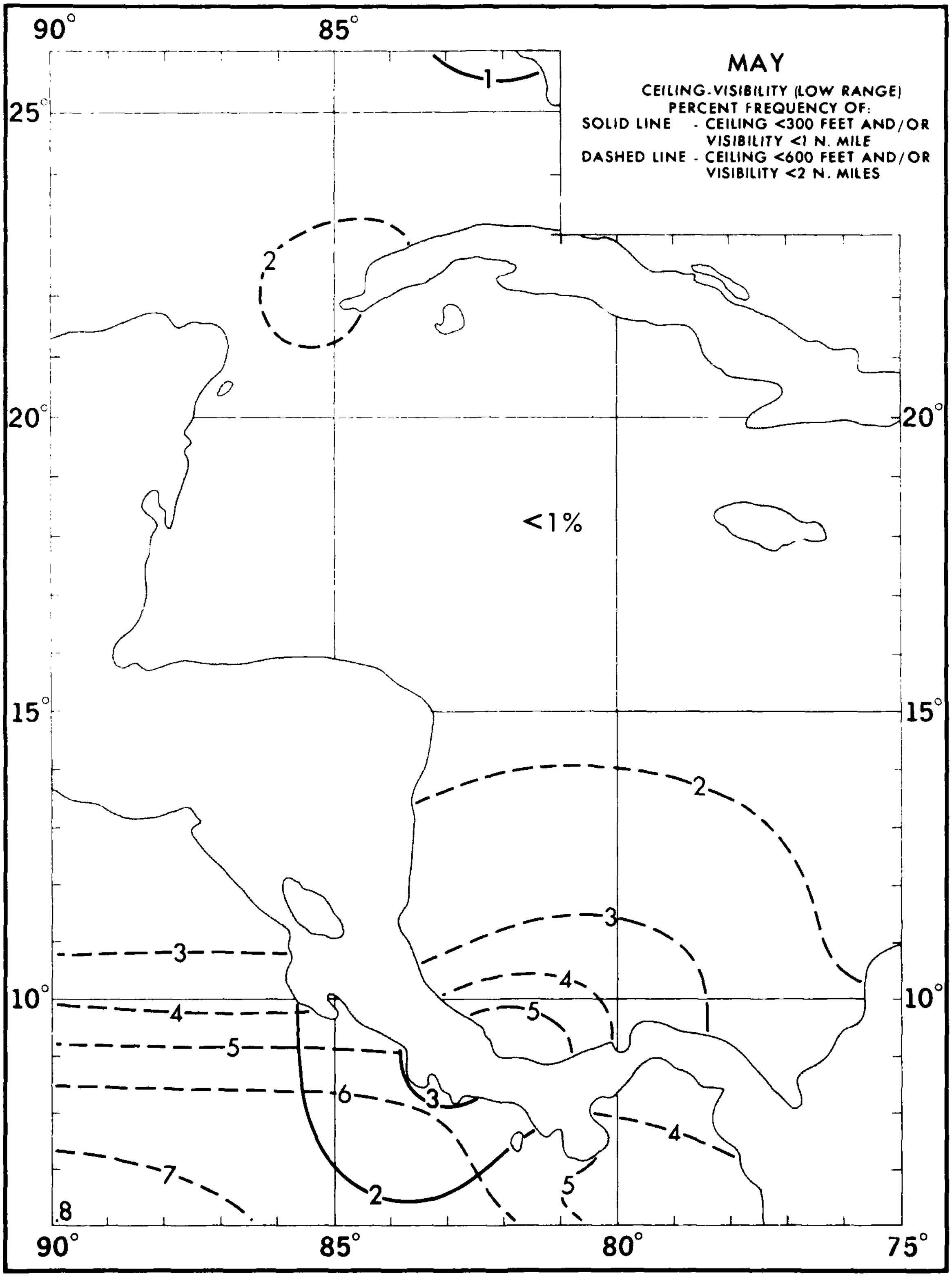

MAY
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°

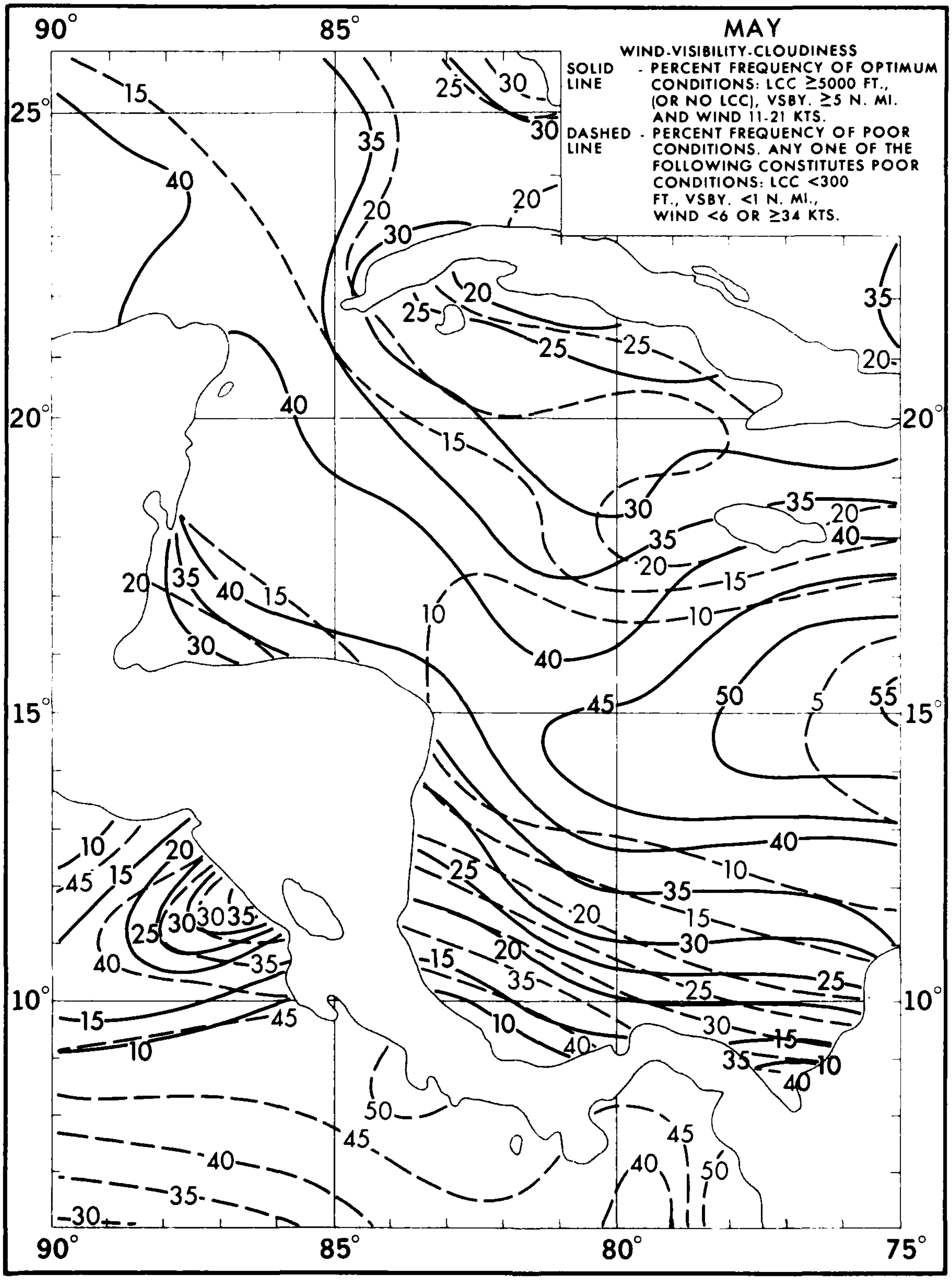

MAY
VISIBILITY (NAUTICAL MILES)
<.5 .2 PERCENT FREQUENCY OF
.5 <1 3.1 VARIOUS RANGES WITHIN ONE-
1 <2 6.7 DEGREE QUADRANGLES.
2 <5 10.0 EXAMPLE:
5 <10 60.0 3.1% OF THE OBSERVED VISIBILI-
≥10 20.0 TIES WERE <1 BUT ≥1/2 N. MILE.
N = 1234 OTHER PERCENTAGES CAN BE
SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
25°
N
20°
20°
90° W
85°
80°
75°

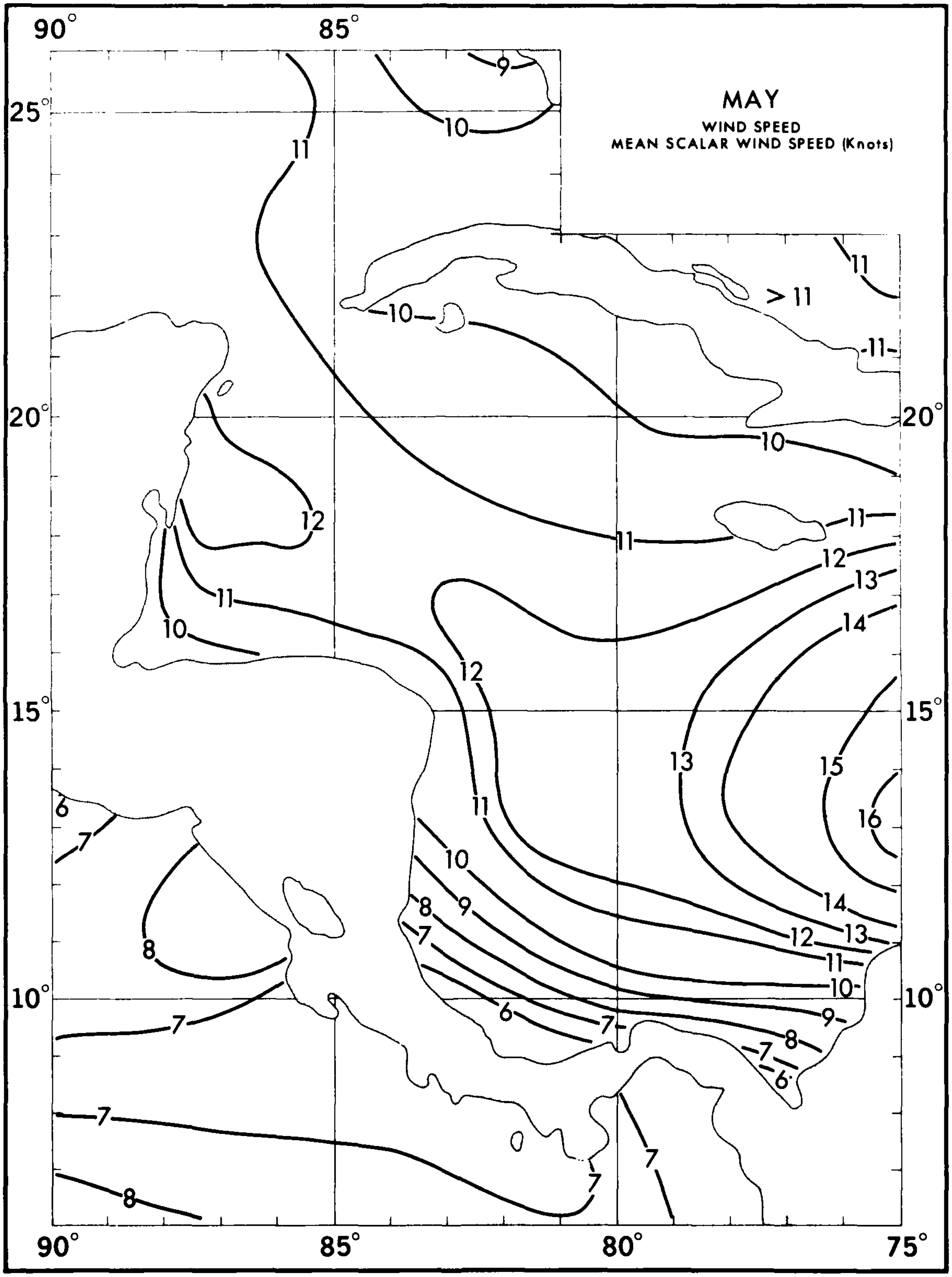

MAY
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
10°
N
W

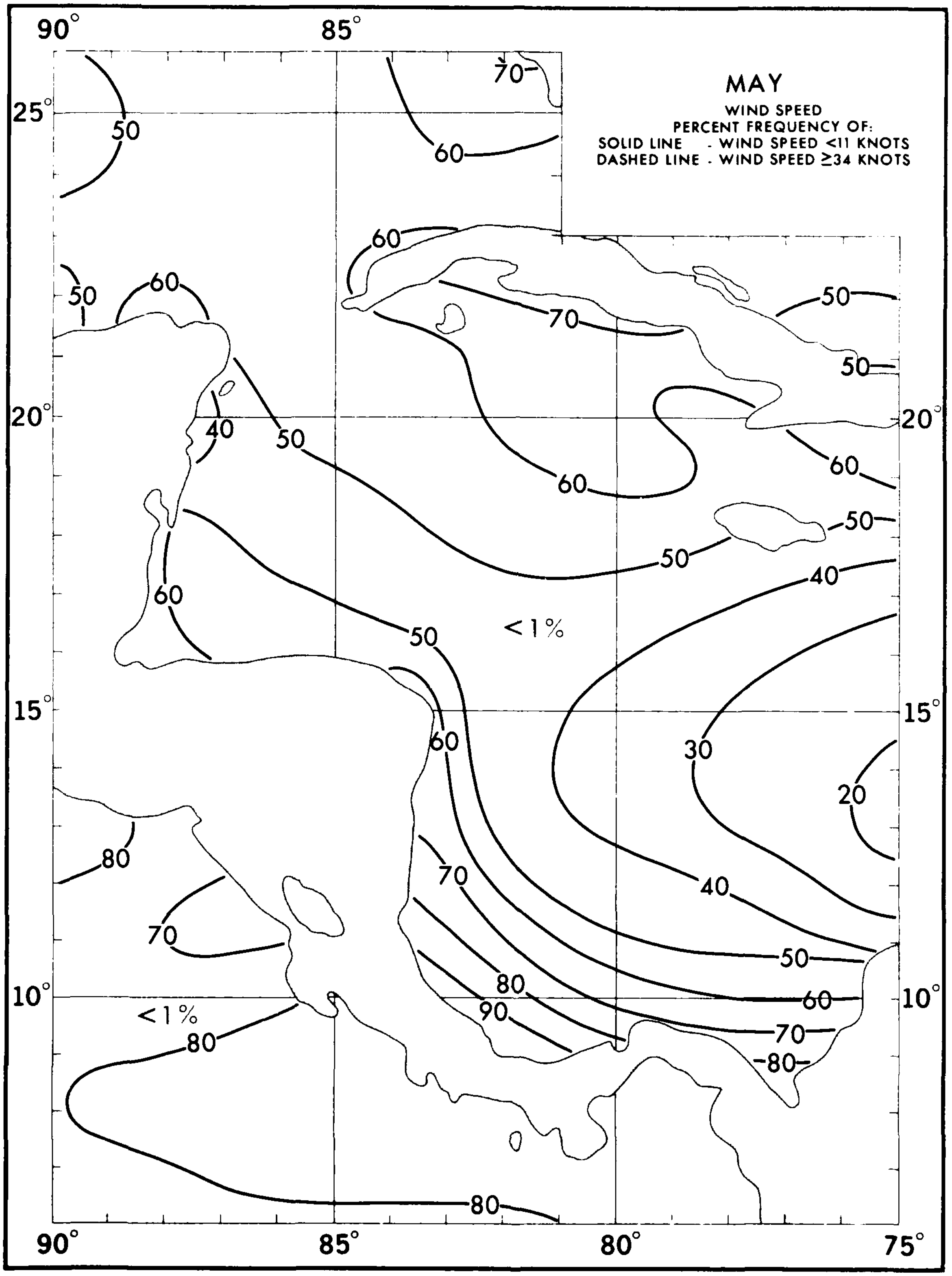


MAY
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
20
5
5
20
20
10
30
40
10
30
15
50
50
15
40
20
50
20
60
25

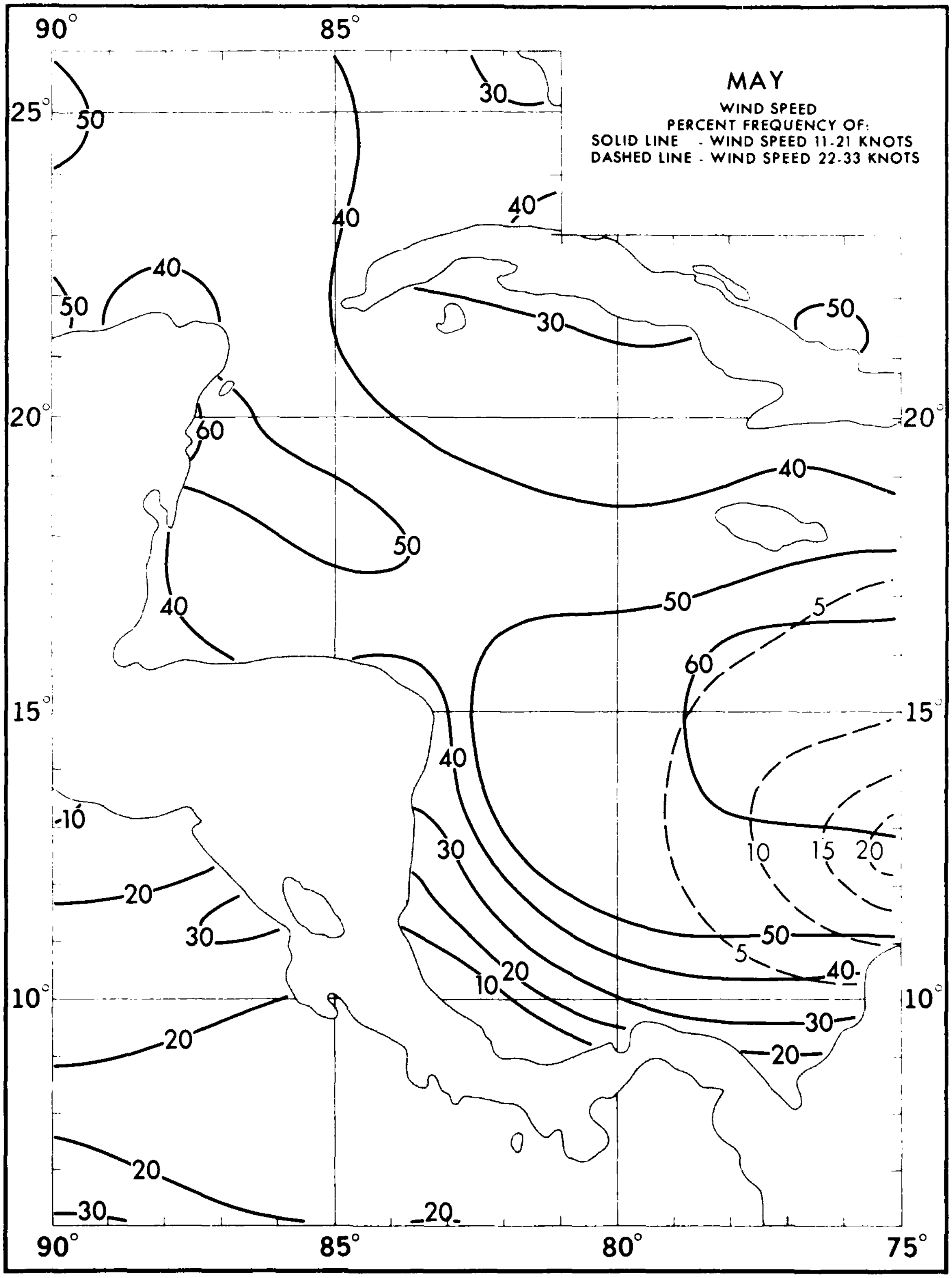

MAY
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
<1%
90°
85°
80°
75°
25°
20°
15°
10°
1
2
3
4
5
6
7
.8


MAY
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°

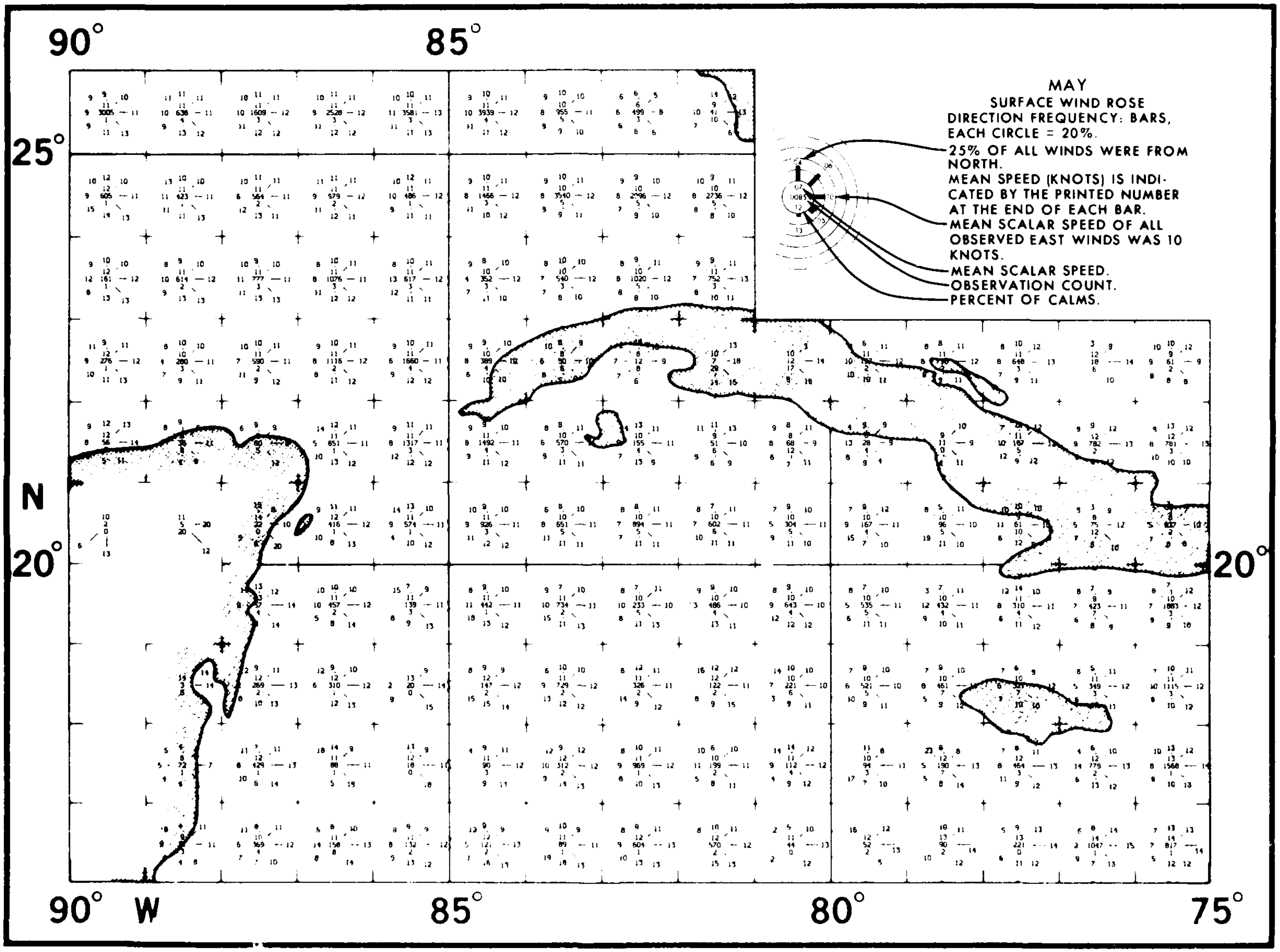

MAY
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°
> 11
16
15
14
13
12
11
10
9
8
7
6



MAY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°
<1%
<1%
50
60
70
40
30
20
80
90

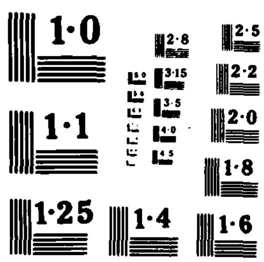


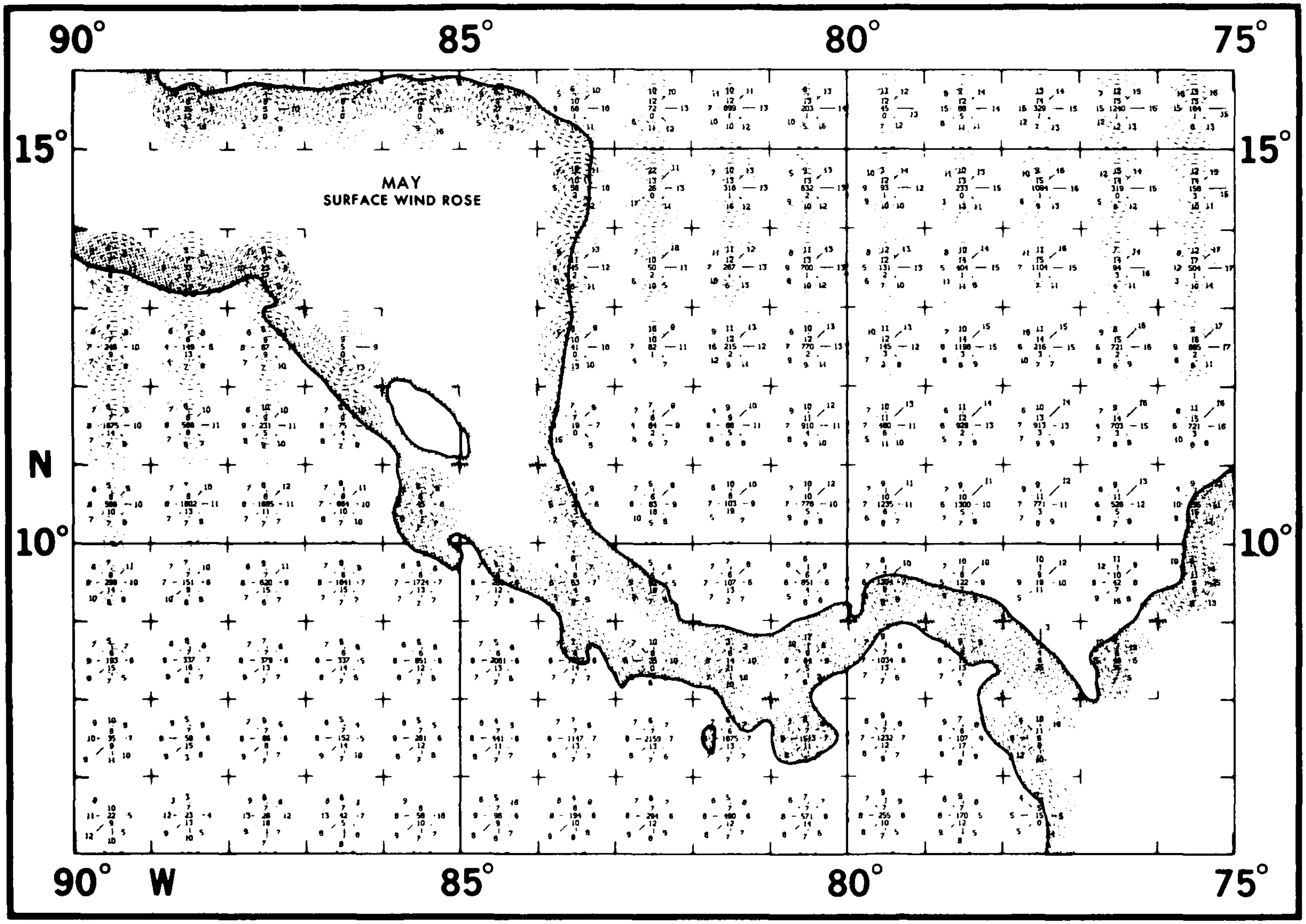
MAY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°


MAY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
80°
75°
W
25°
20°
N
20°

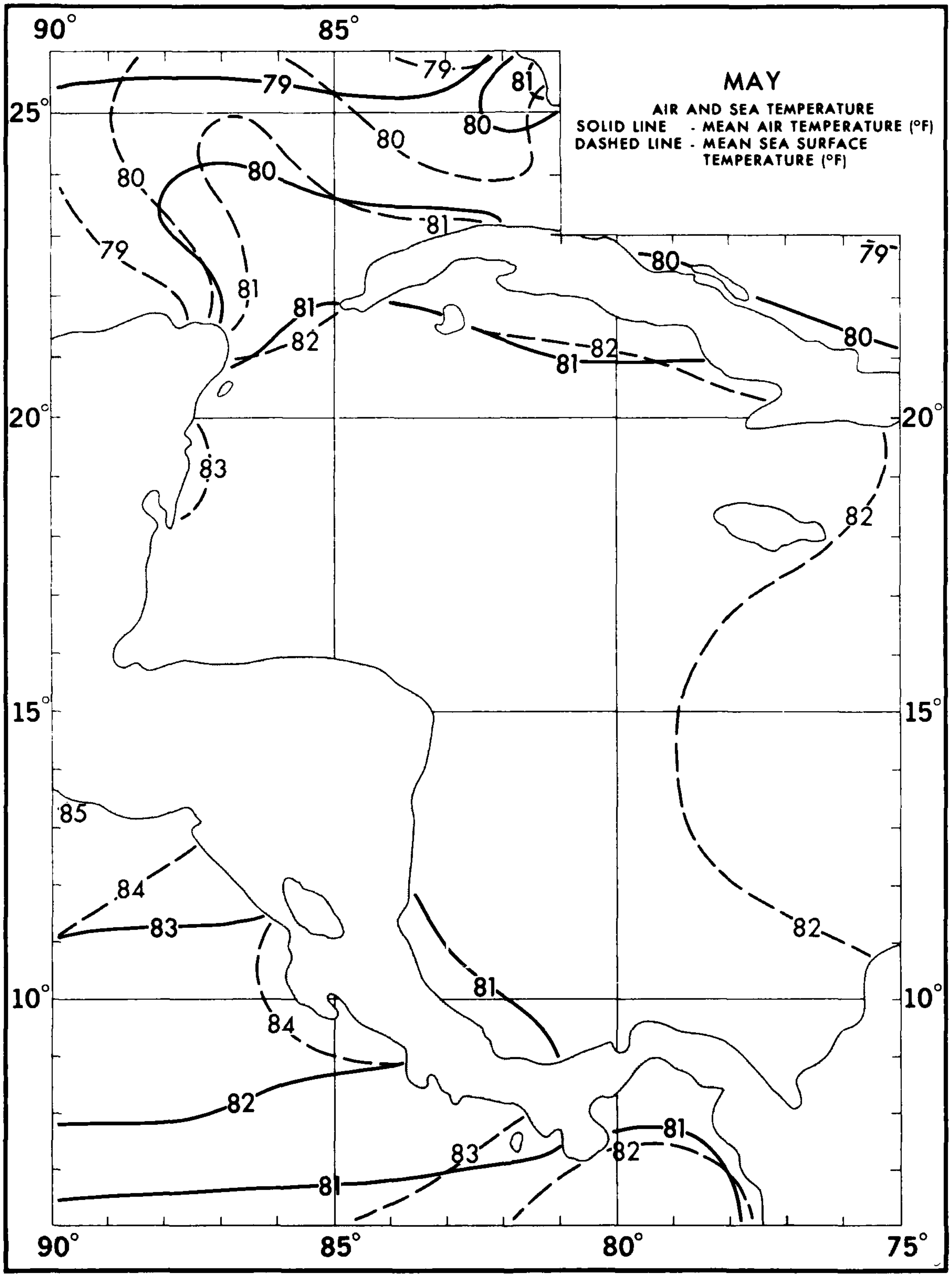
AD-A160 159 US NAVY CLIMATIC STUDY OF THE CARIBBEAN SEA AND GULF OF MEXICO VOLUME 1 W..(U) NAVAL OCEANOGRAPHY COMMAND NSTL STATION MS SEP 85 2/3

UNCLASSIFIED F/G 4/2 NL

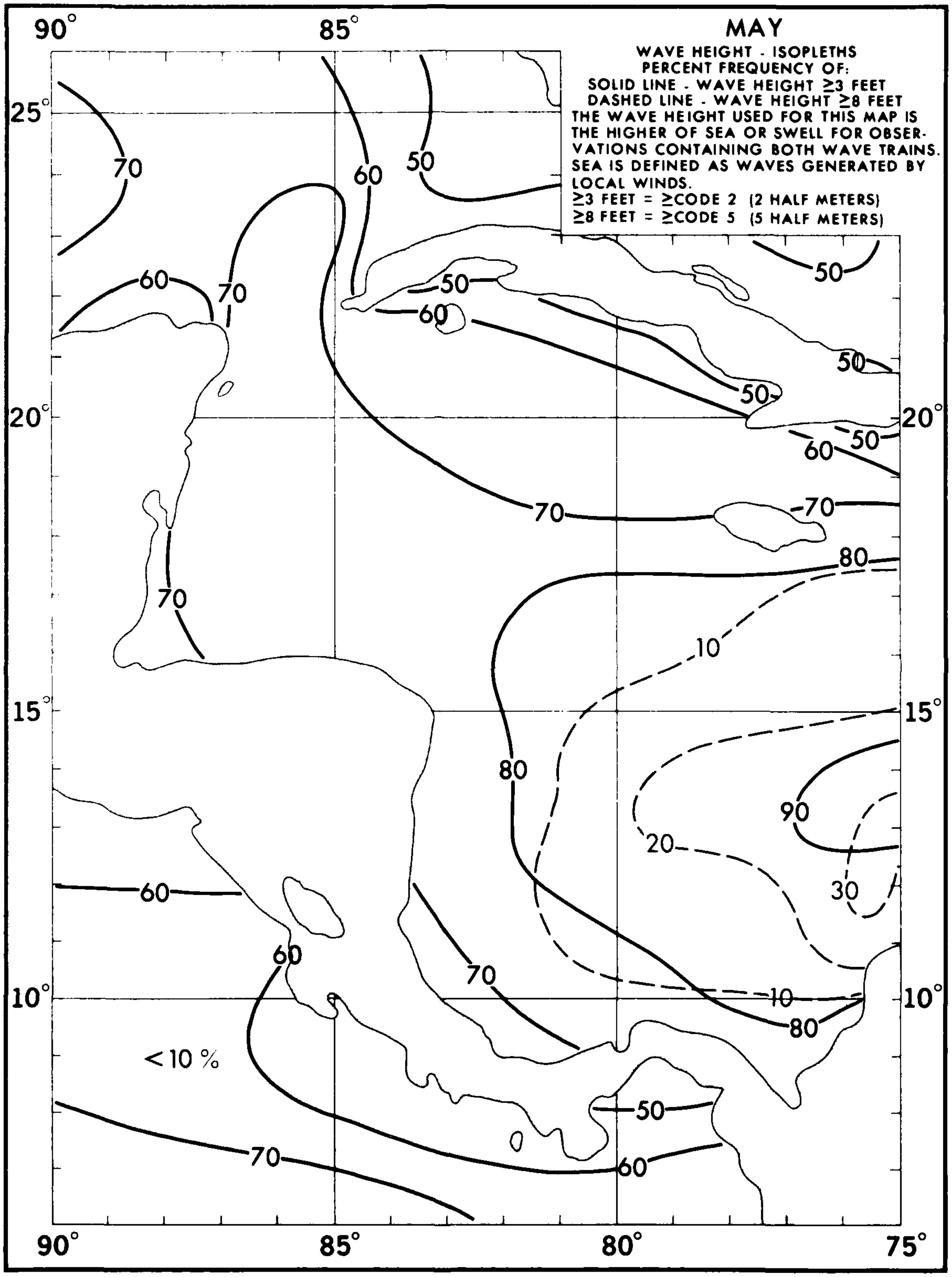

1·0
2·8
2·5
3·15
2·2
3·5
1·1
2·0
4·0
4·5
1·8
1·25
1·4
1·6



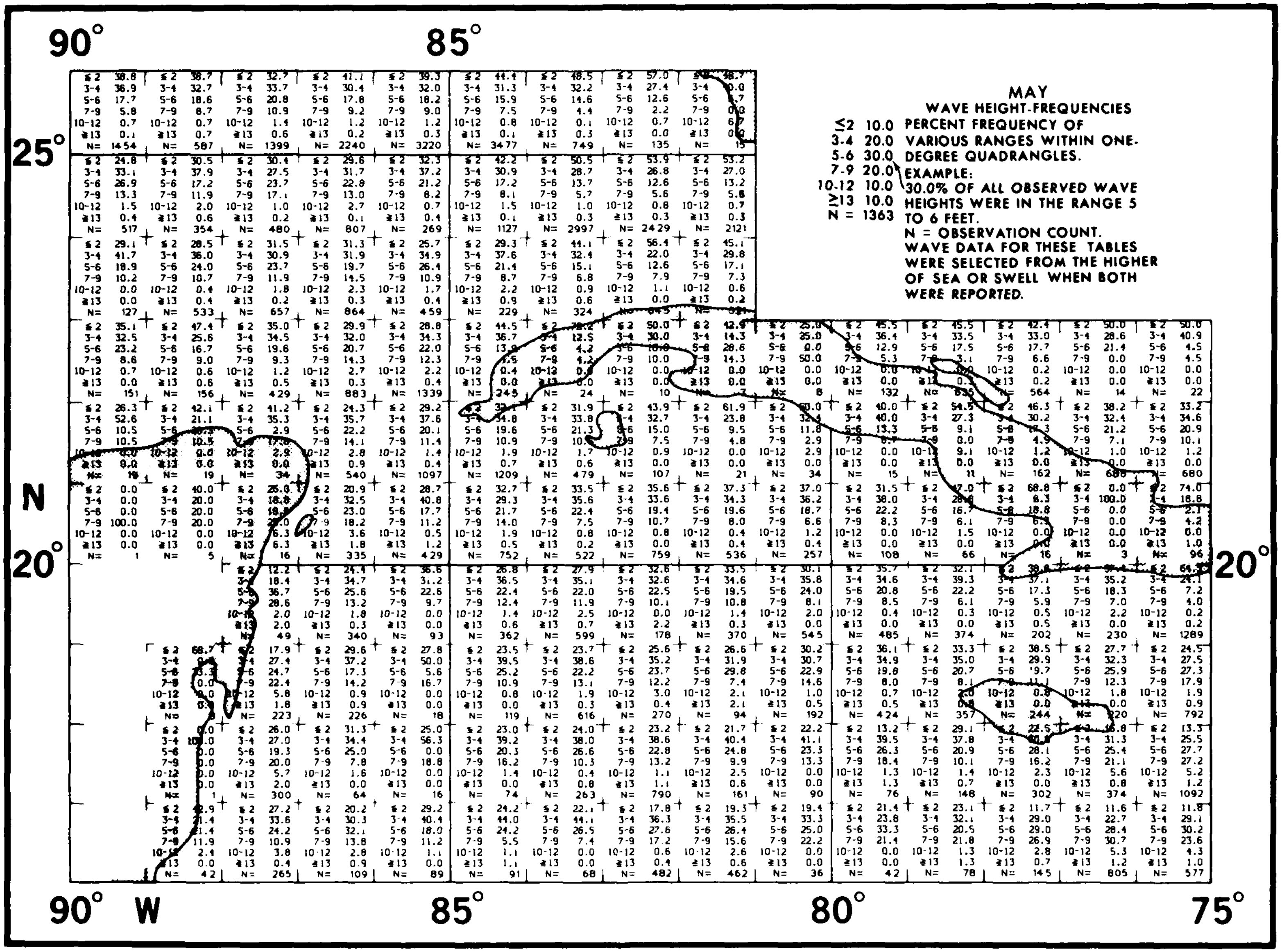
MAY
SURFACE WIND ROSE
90°
85°
80°
75°
15°
10°
N
W

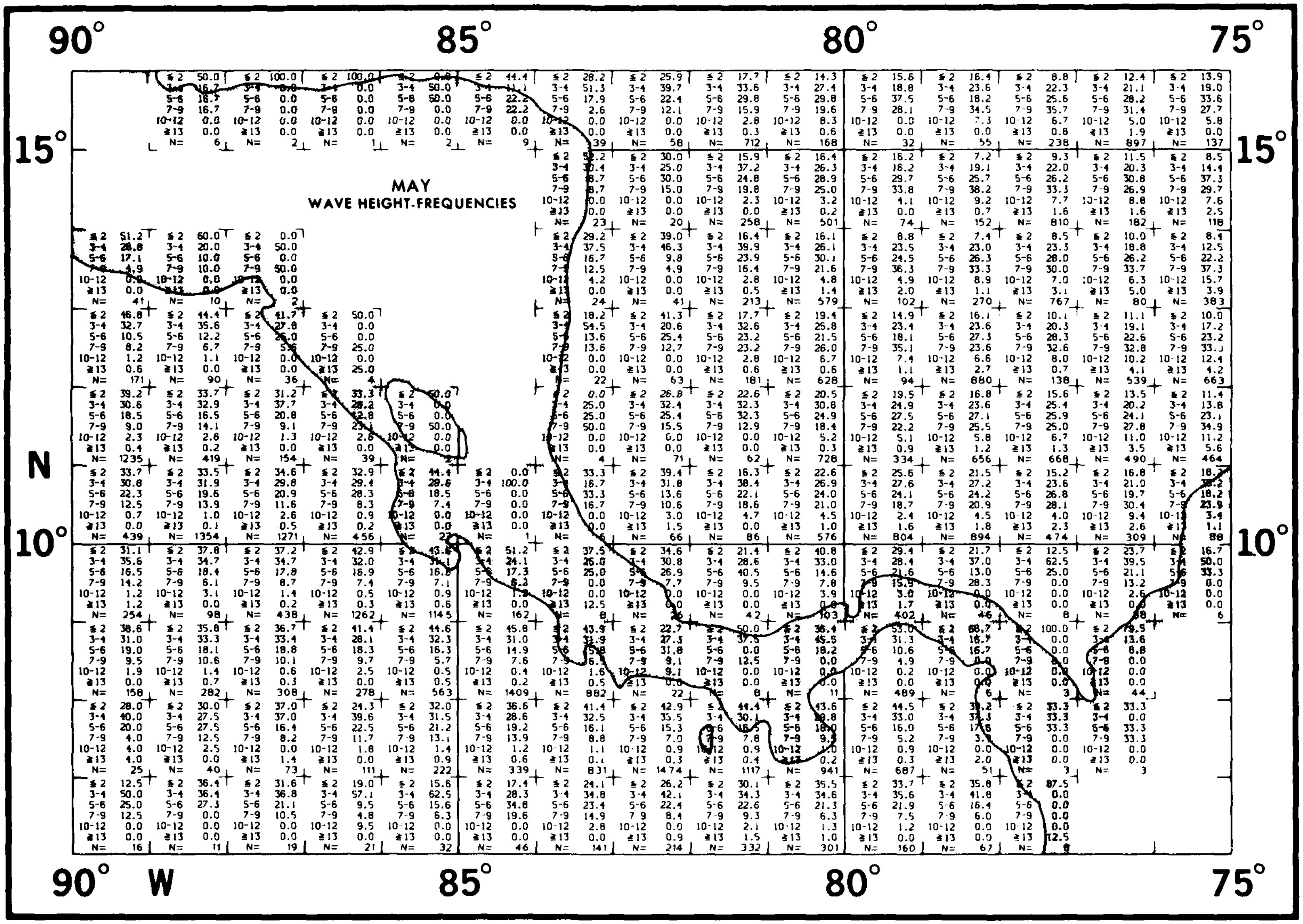


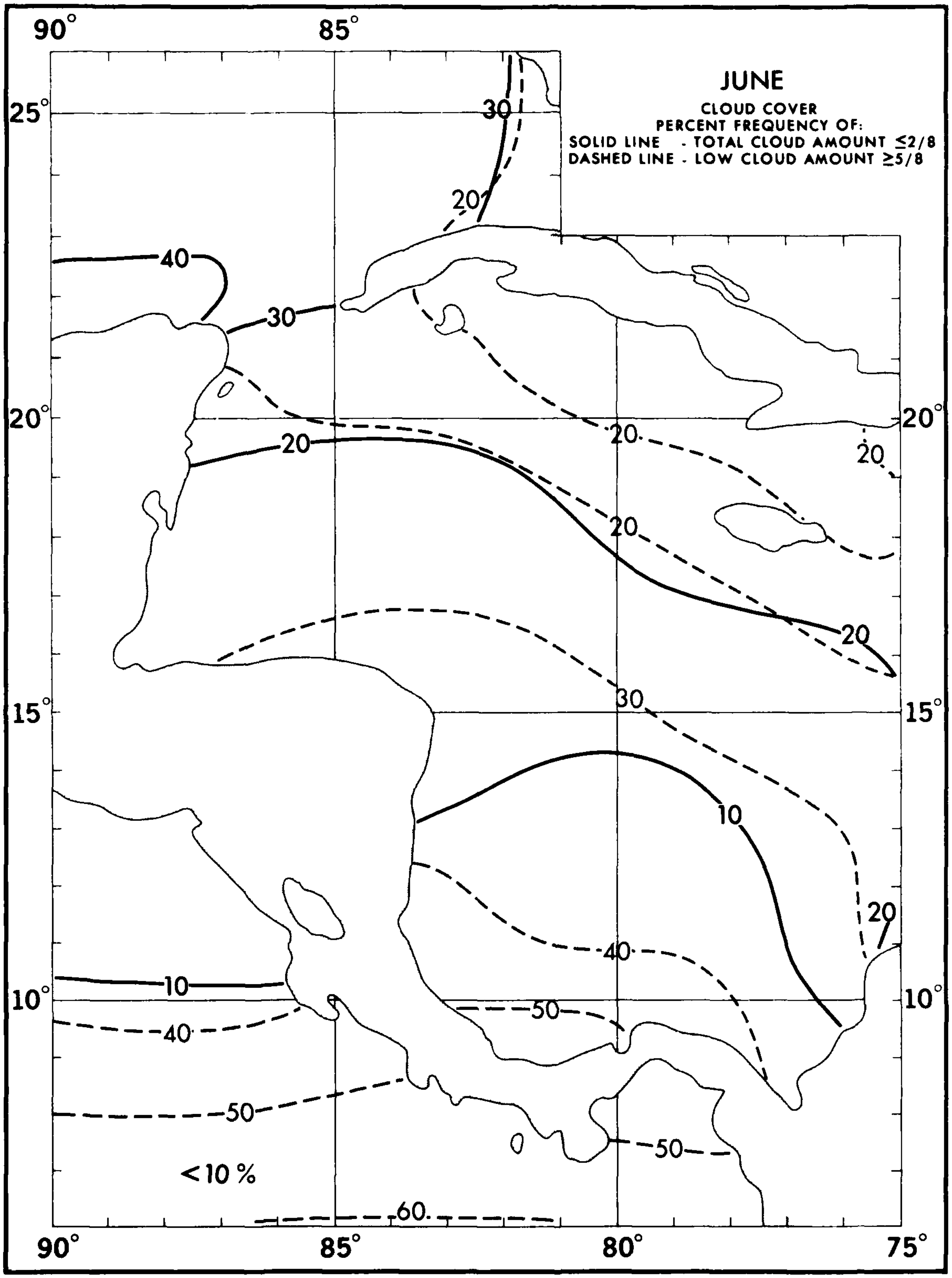
MAY
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°
79
80
81
82
83
84
85



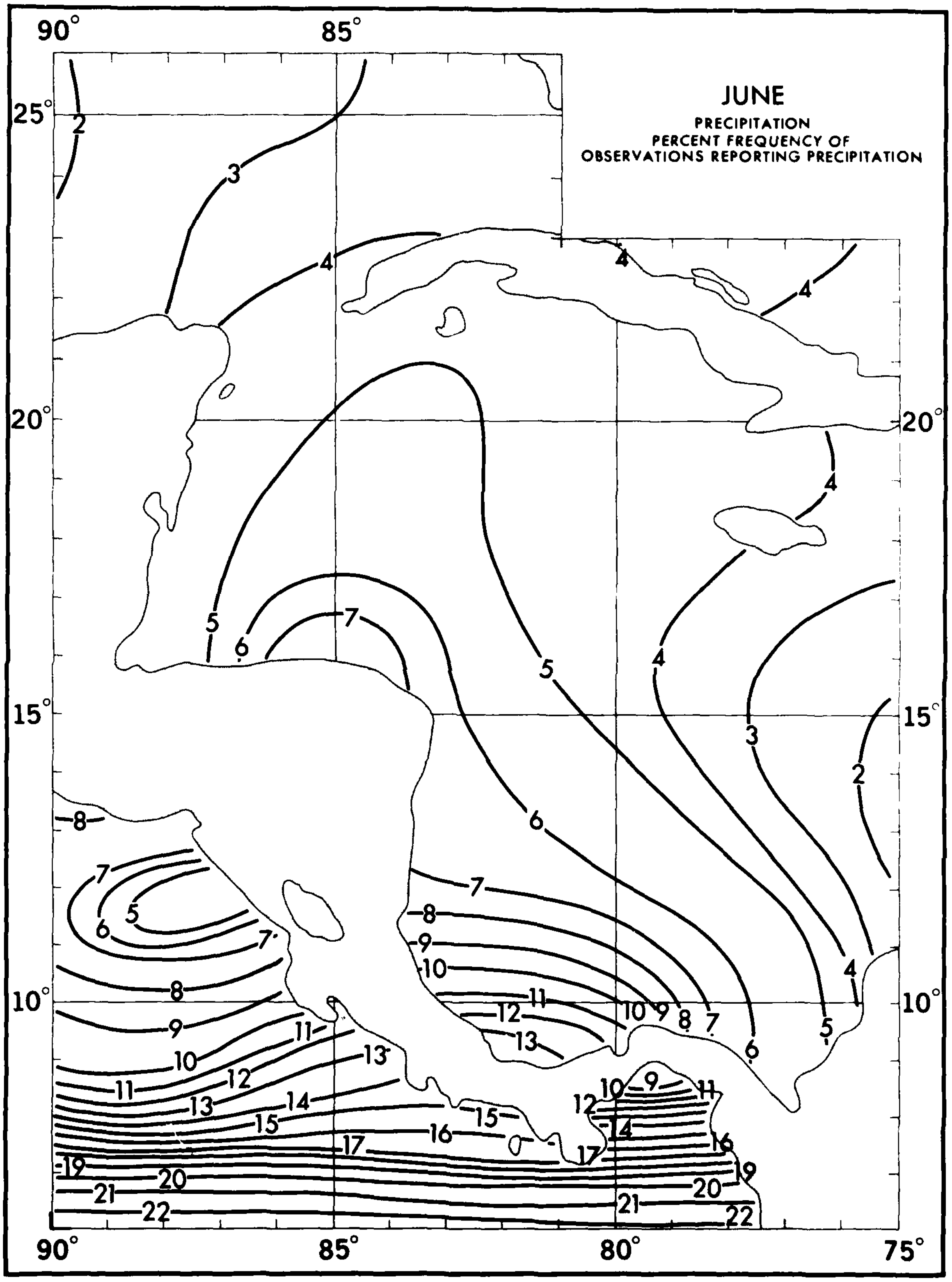
MAY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°
70
60
50
80
90
10
20
30
<10 %

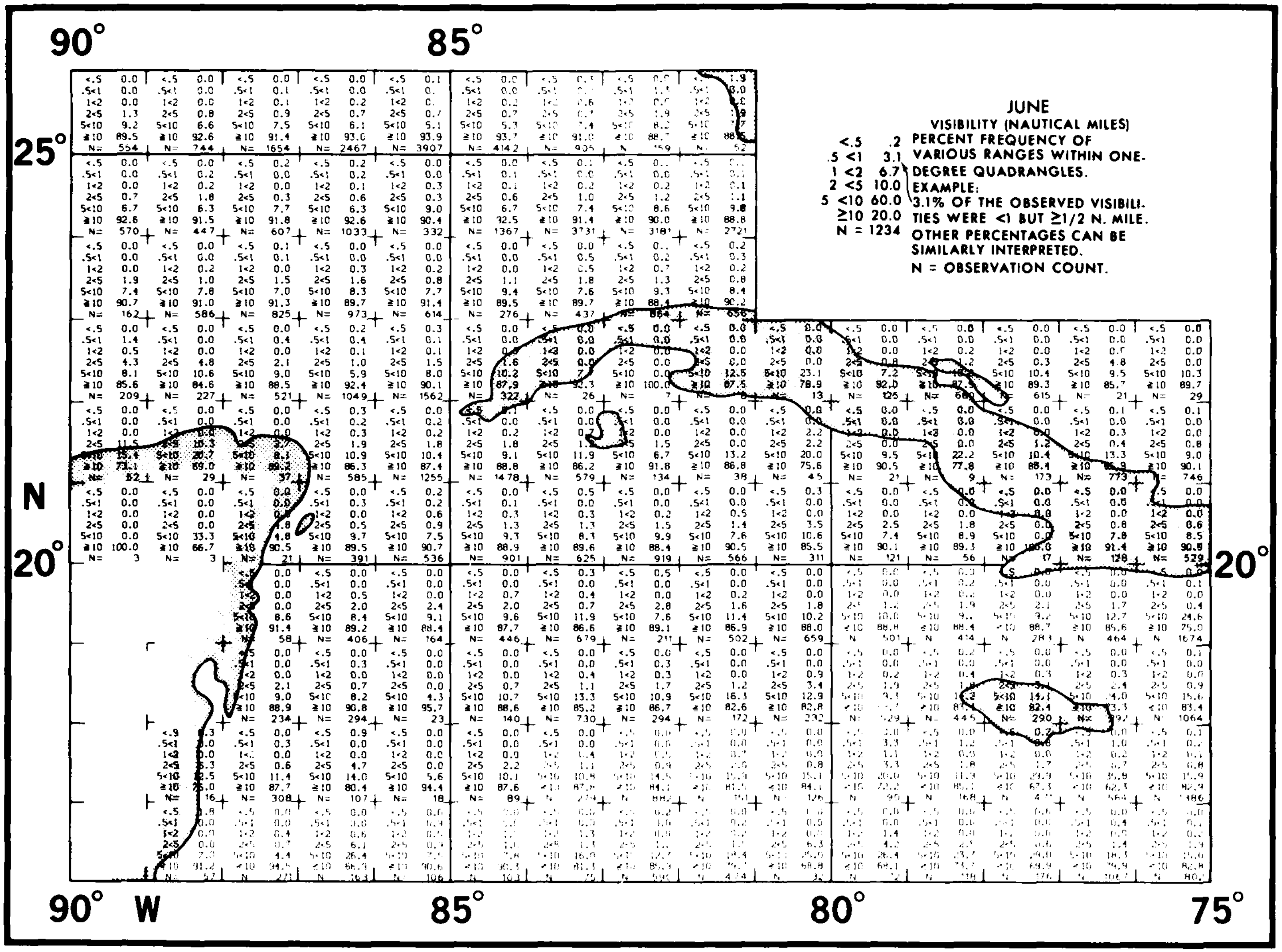

MAY
WAVE HEIGHT-FREQUENCIES
≤2 10.0 PERCENT FREQUENCY OF
3-4 20.0 VARIOUS RANGES WITHIN ONE-
5-6 30.0 DEGREE QUADRANGLES.
7-9 20.0 EXAMPLE:
10-12 10.0 30.0% OF ALL OBSERVED WAVE
≥13 10.0 HEIGHTS WERE IN THE RANGE 5
N = 1363 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES
WERE SELECTED FROM THE HIGHER
OF SEA OR SWELL WHEN BOTH
WERE REPORTED.
90°
85°
25°
N
20°
90° W
85°
80°
75°
20°

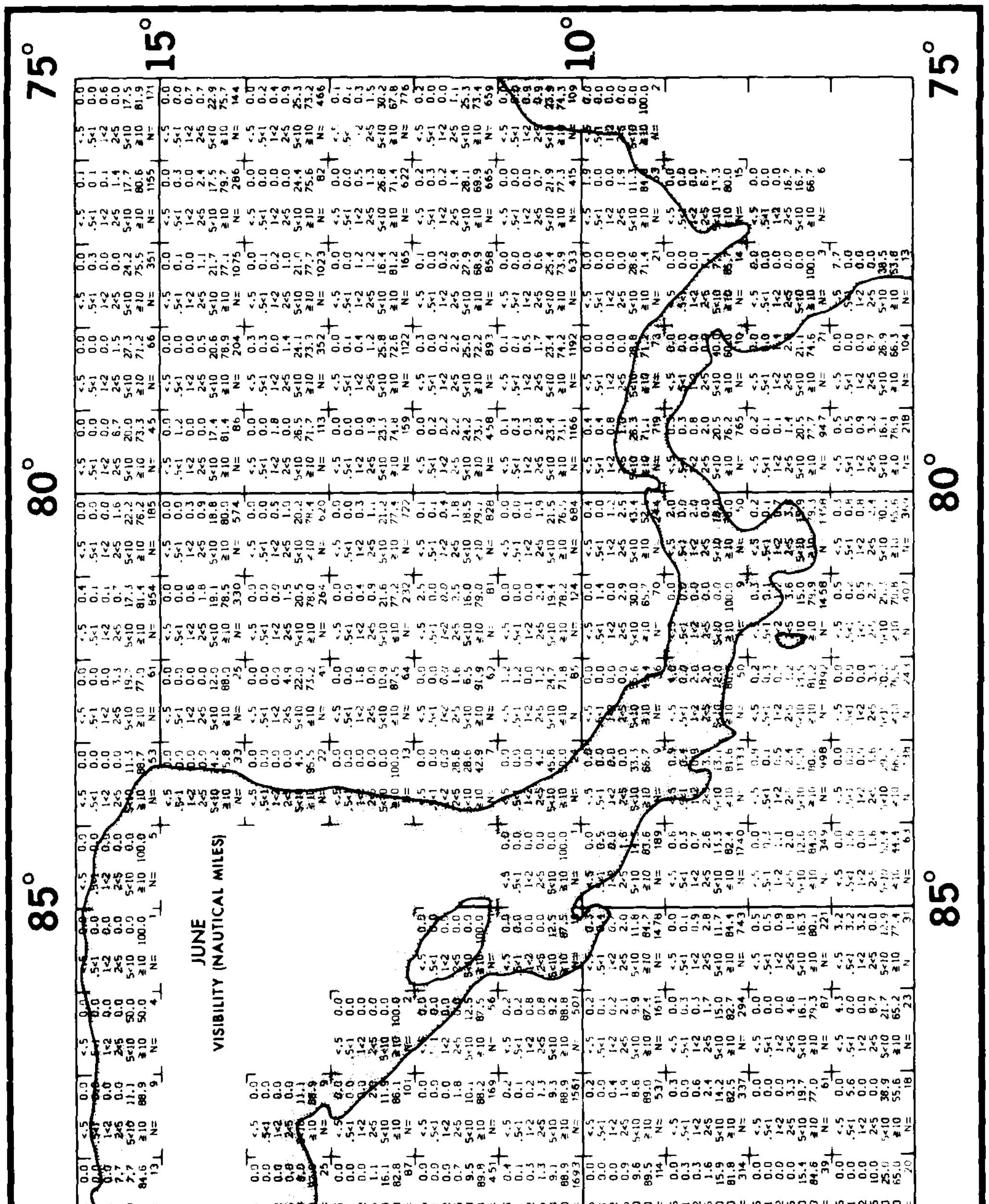

MAY
WAVE HEIGHT-FREQUENCIES
90°
85°
80°
75°
15°
10°
N
W

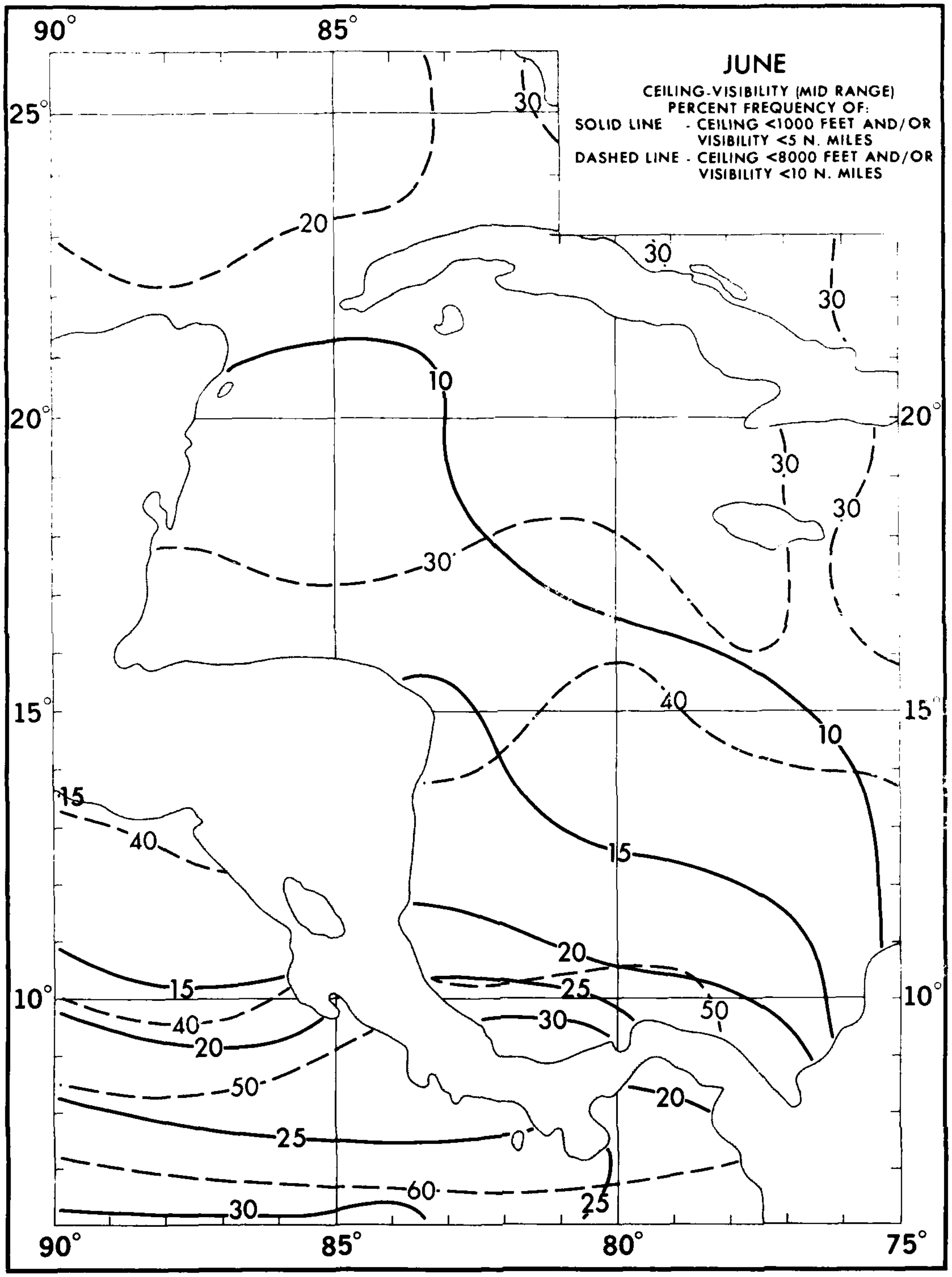


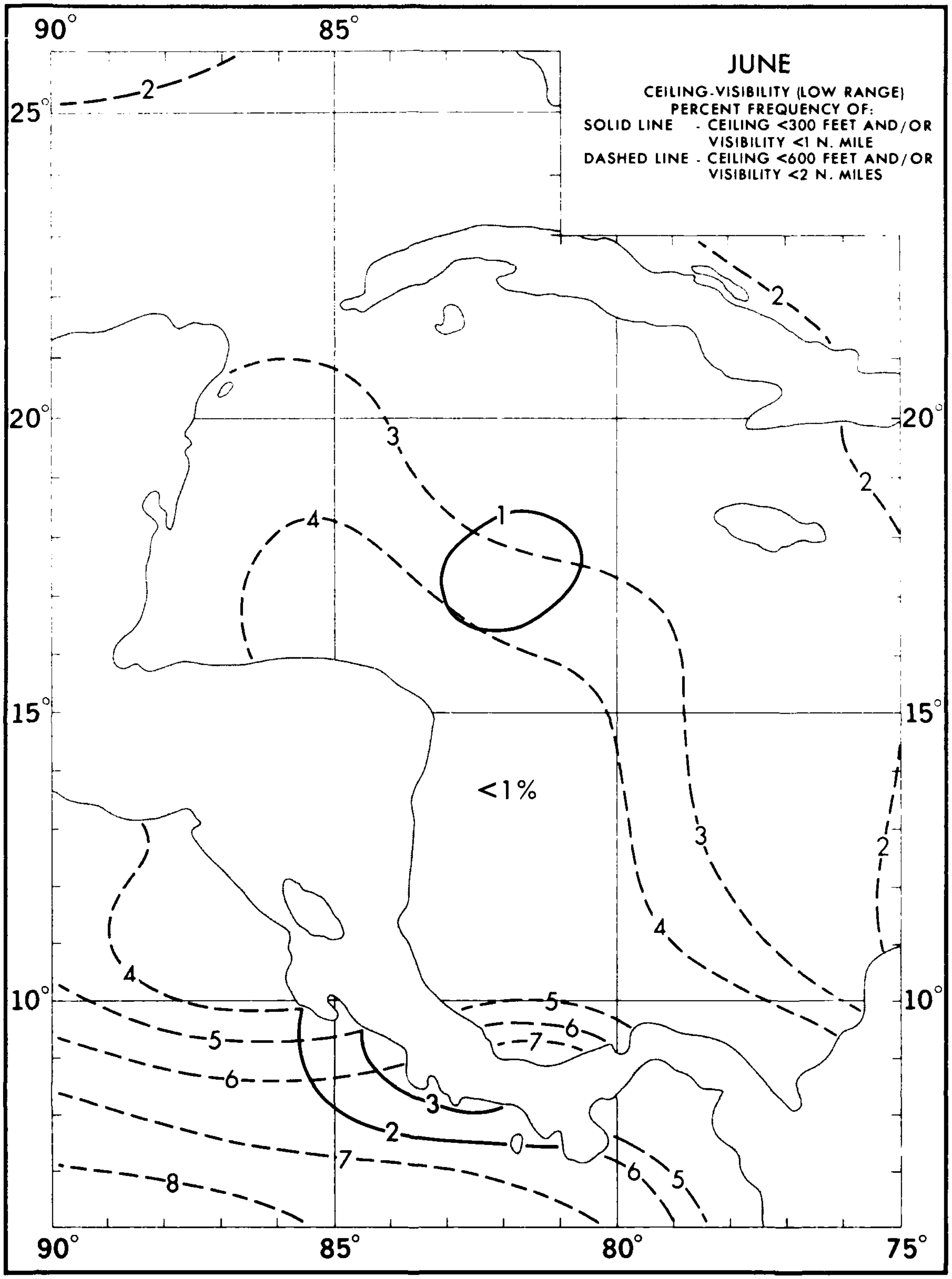
JUNE
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°
40
30
20
10
50
60
<10 %

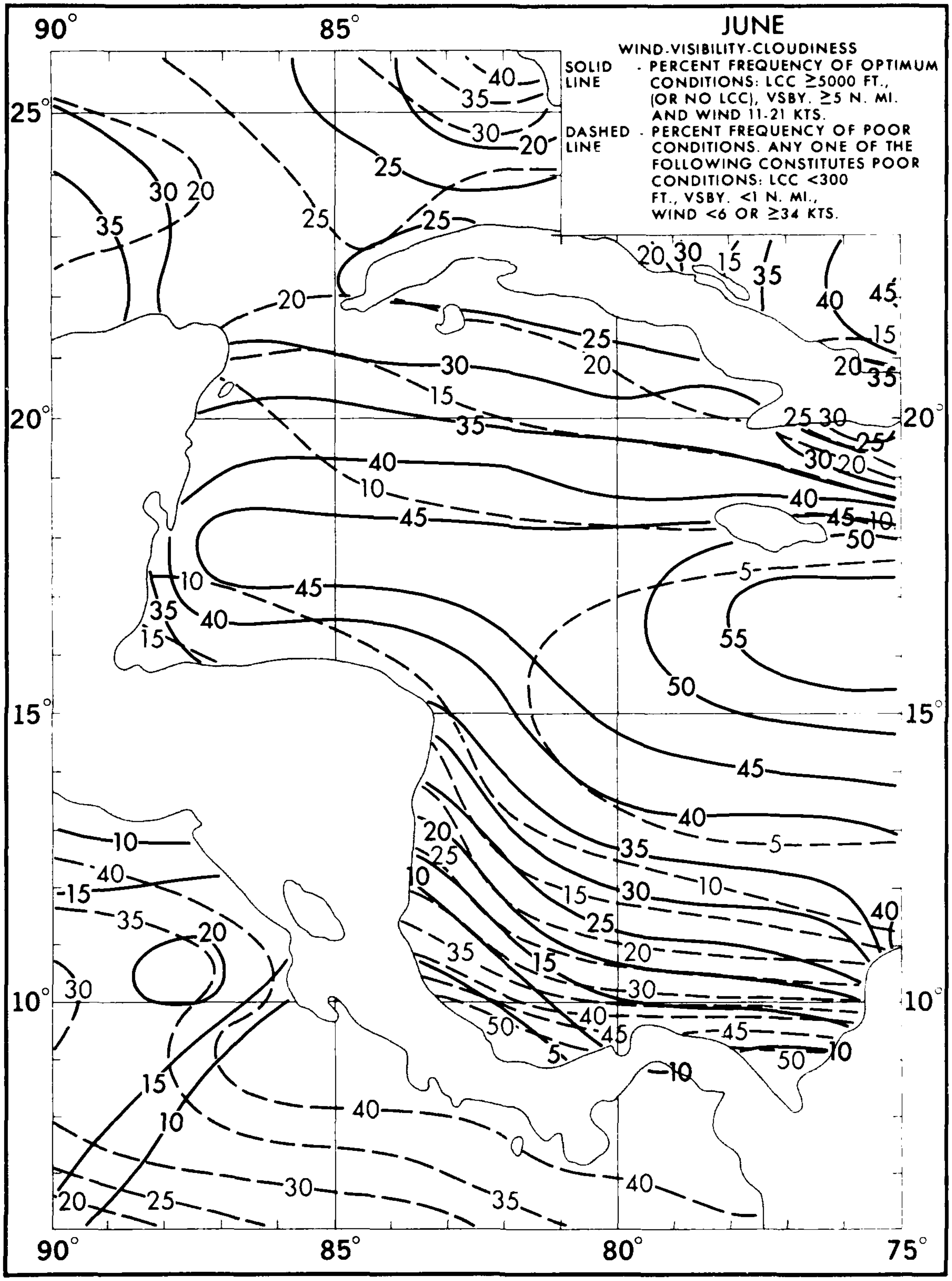

JUNE
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°

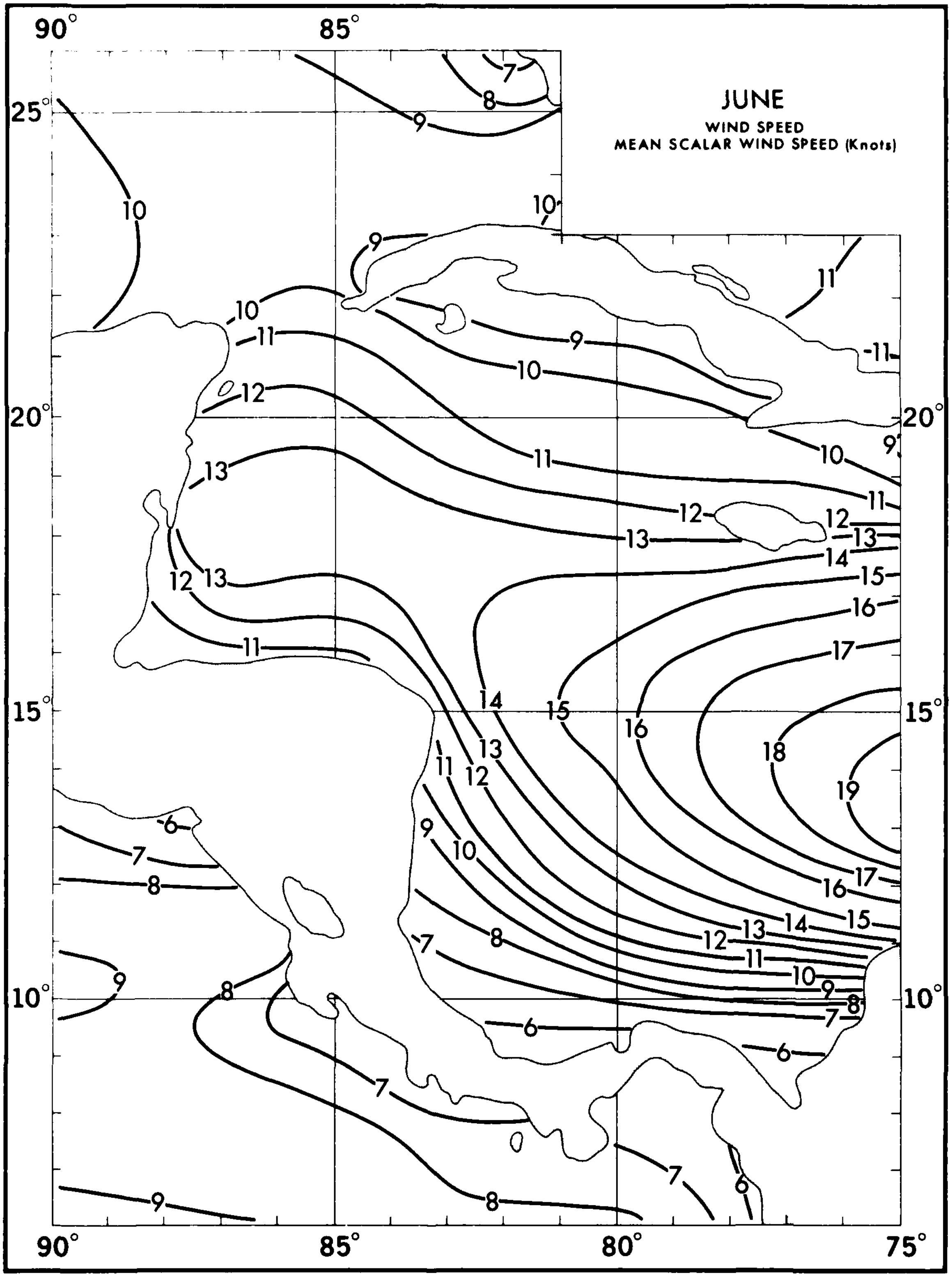

JUNE
VISIBILITY (NAUTICAL MILES)
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
80°
75°
25°
20°
N
W

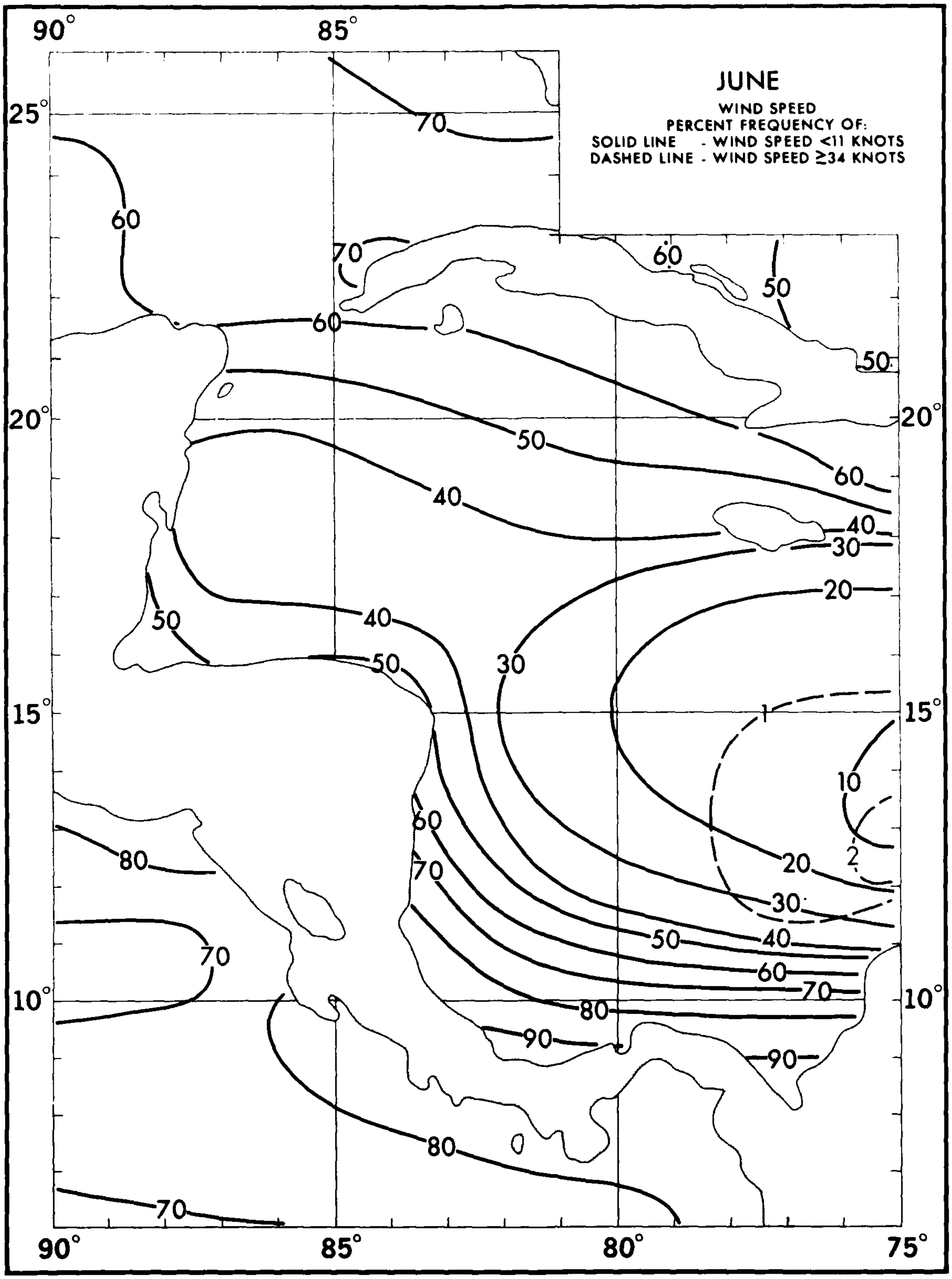

JUNE
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
10°
N
W

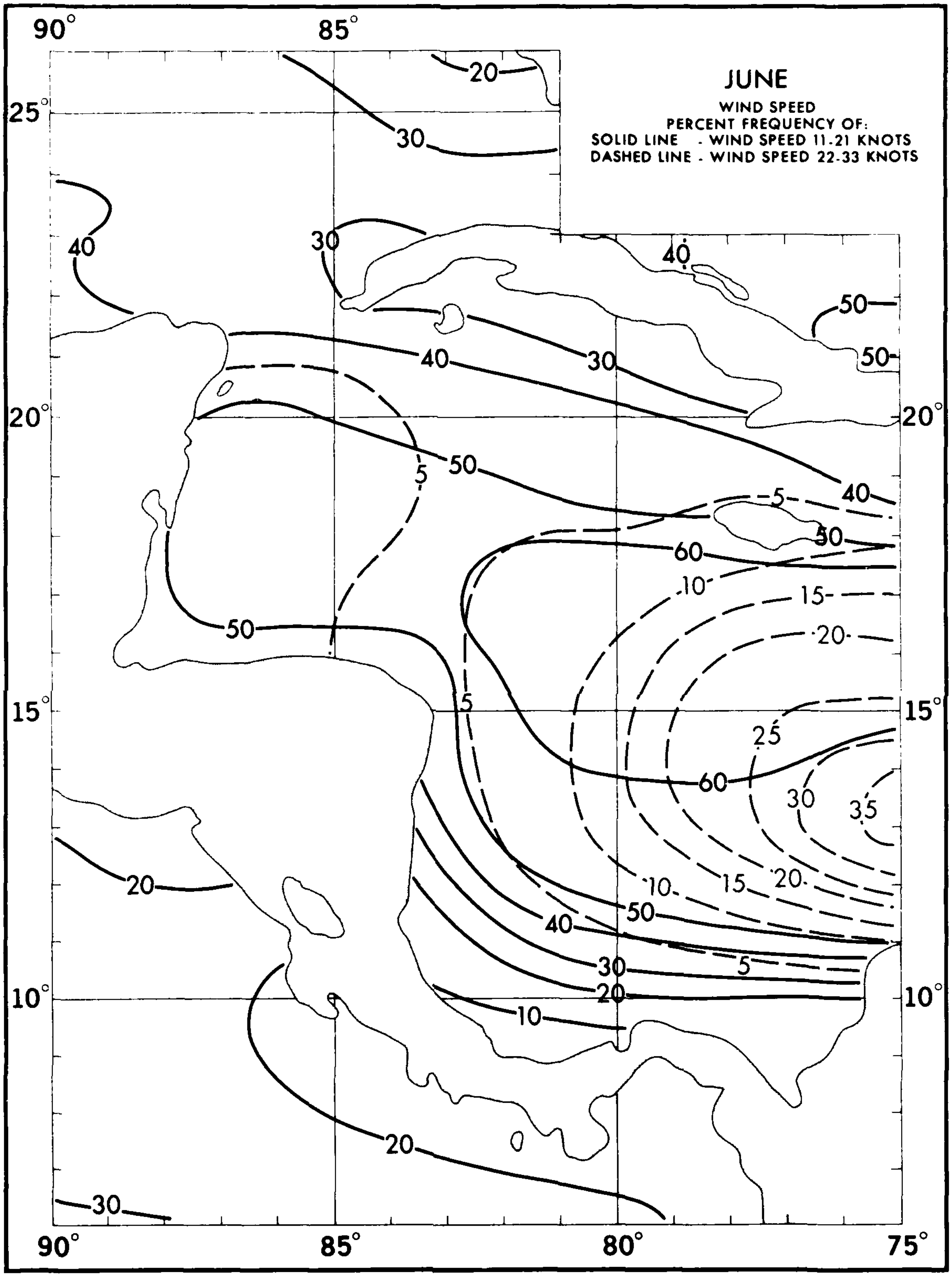

JUNE
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
10
15
20
25
30
40
50
60

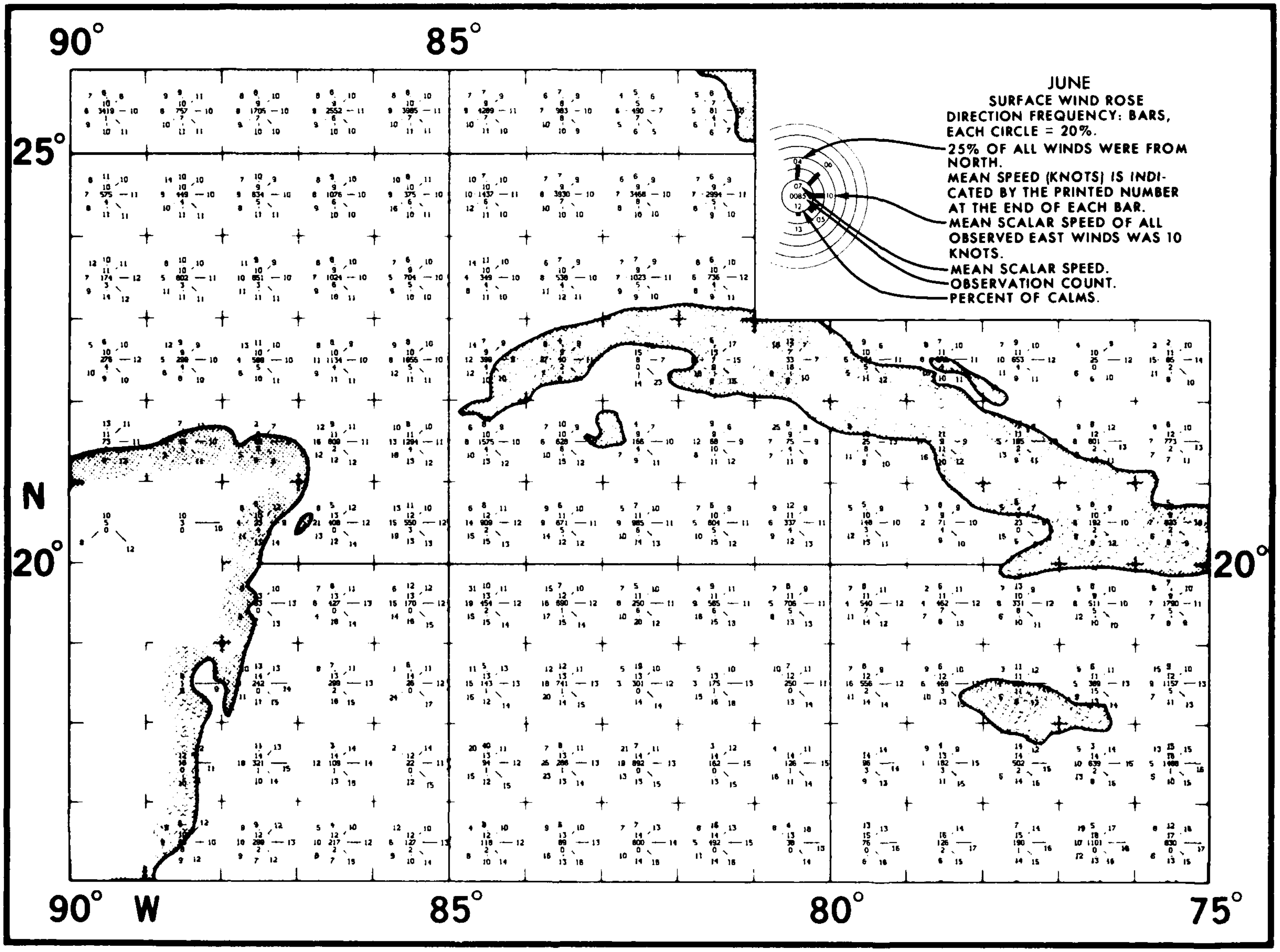

JUNE
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
<1%

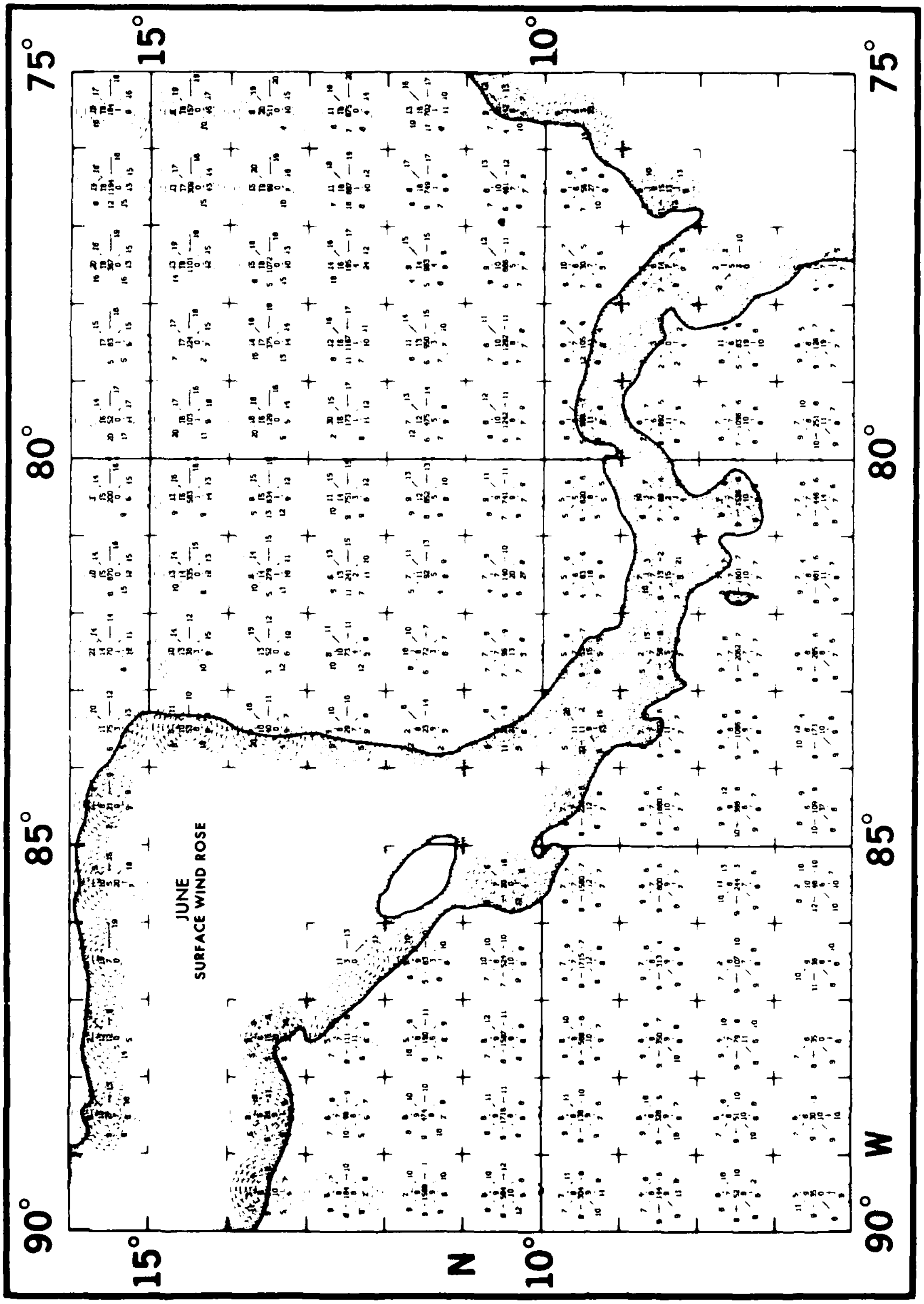

JUNE
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°

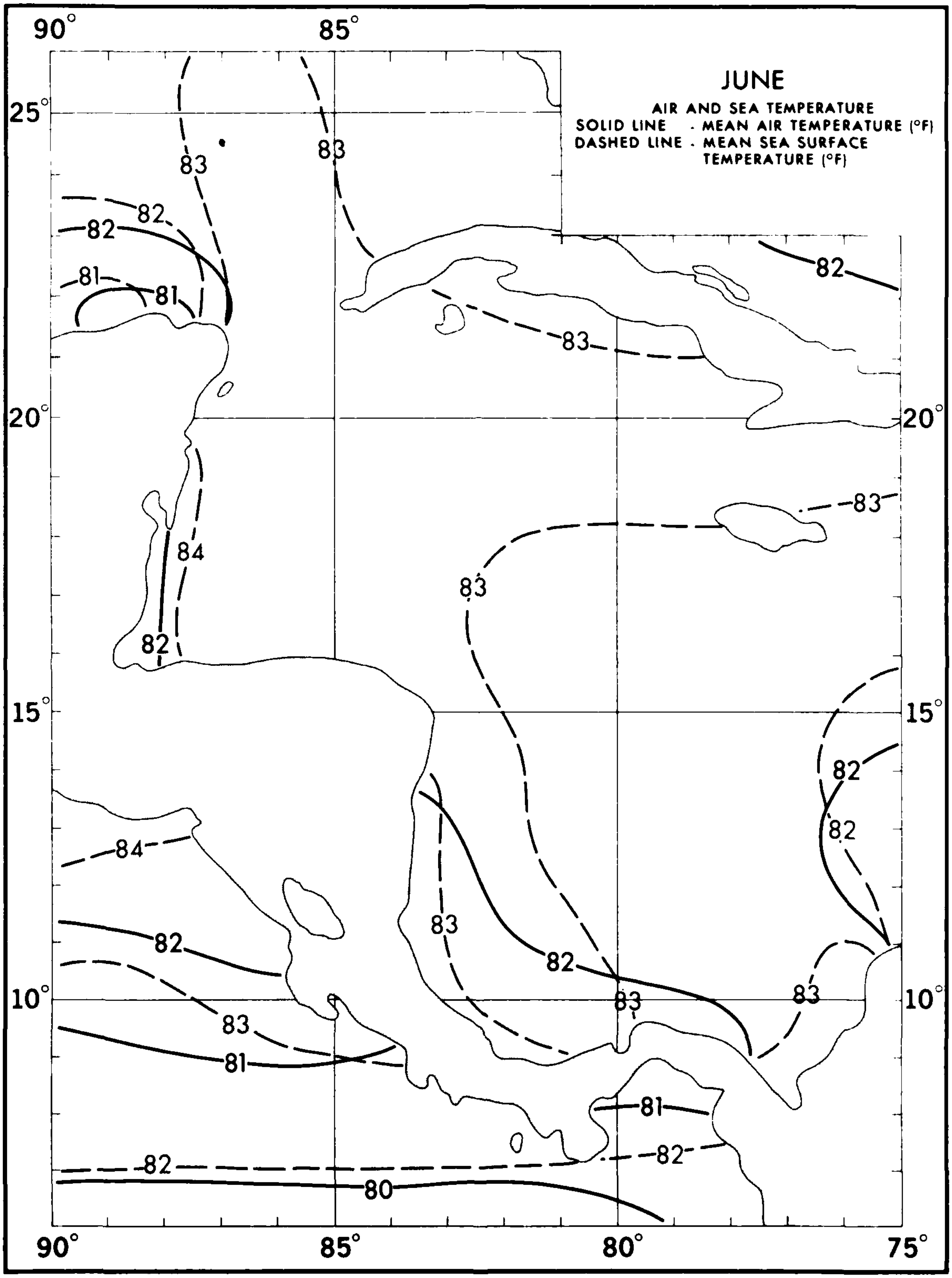

JUNE
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°


JUNE
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°
70
60
50
40
30
20
10
1
2
80
90


JUNE
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°


JUNE
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
80°
75°
25°
20°
N
W


JUNE
SURFACE WIND ROSE
75°
80°
85°
90°
15°
10°
N
W



JUNE
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°
83
83
82
82
81
81
84
82
82
83
83
83
82
82
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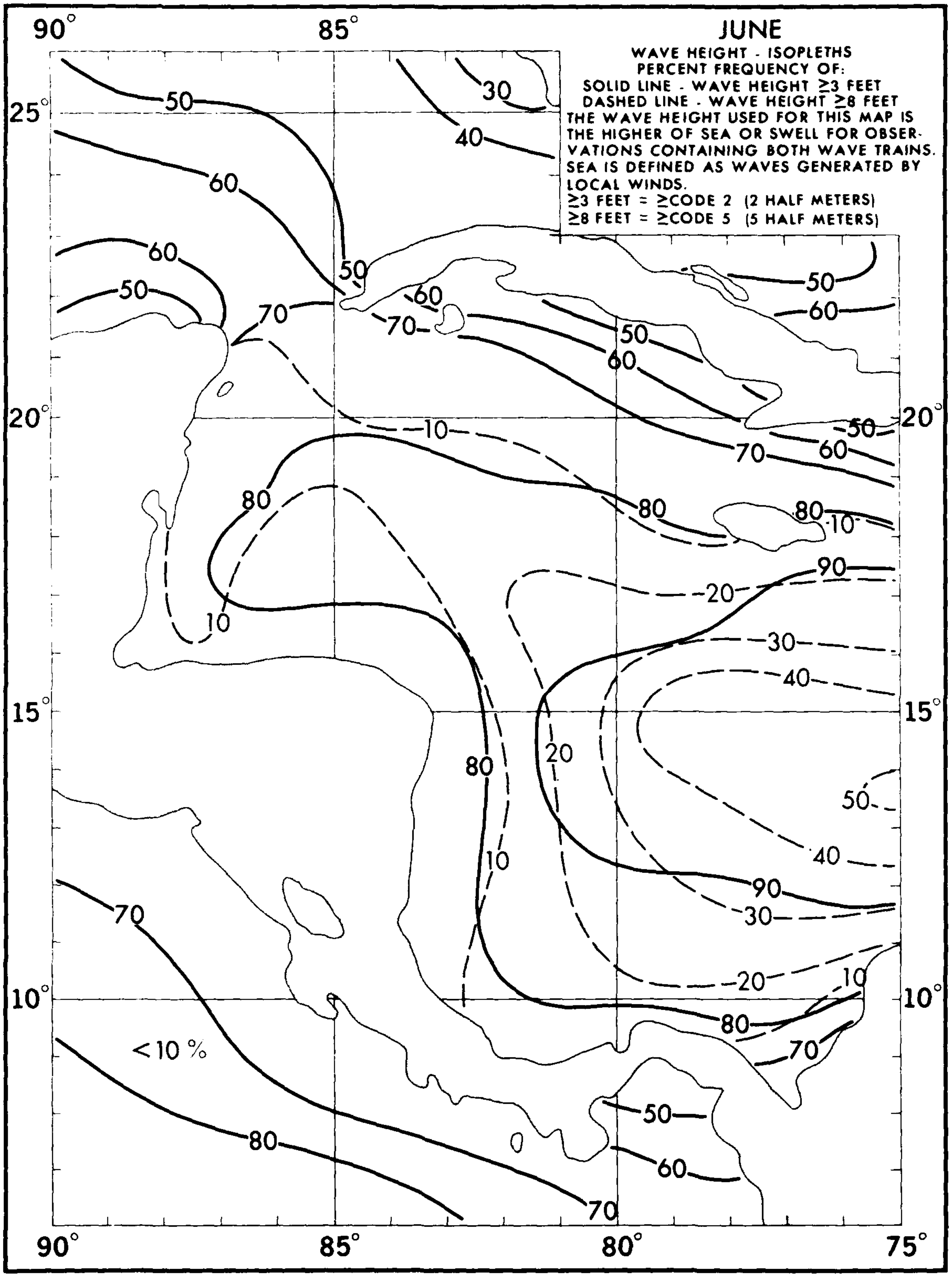
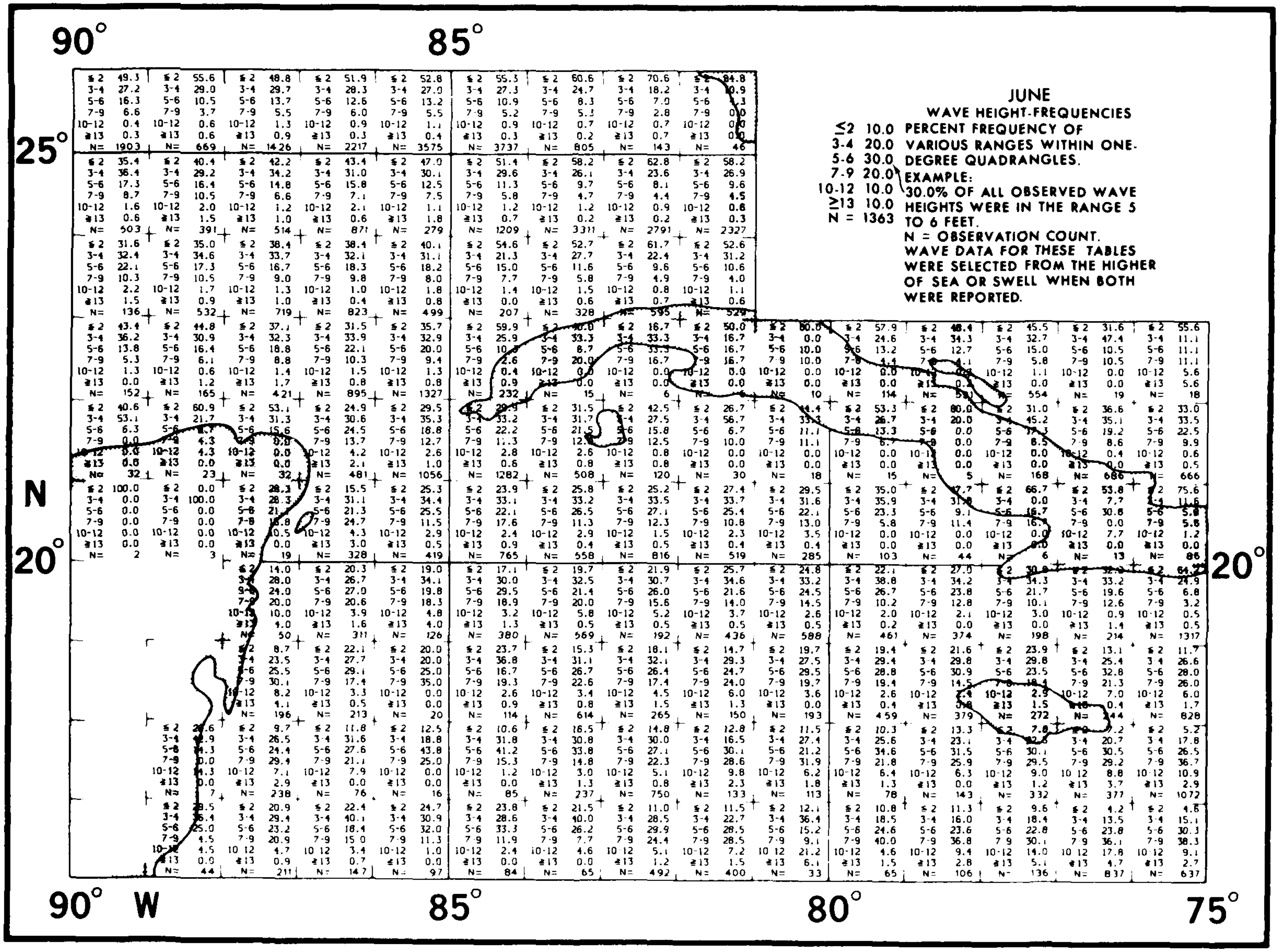
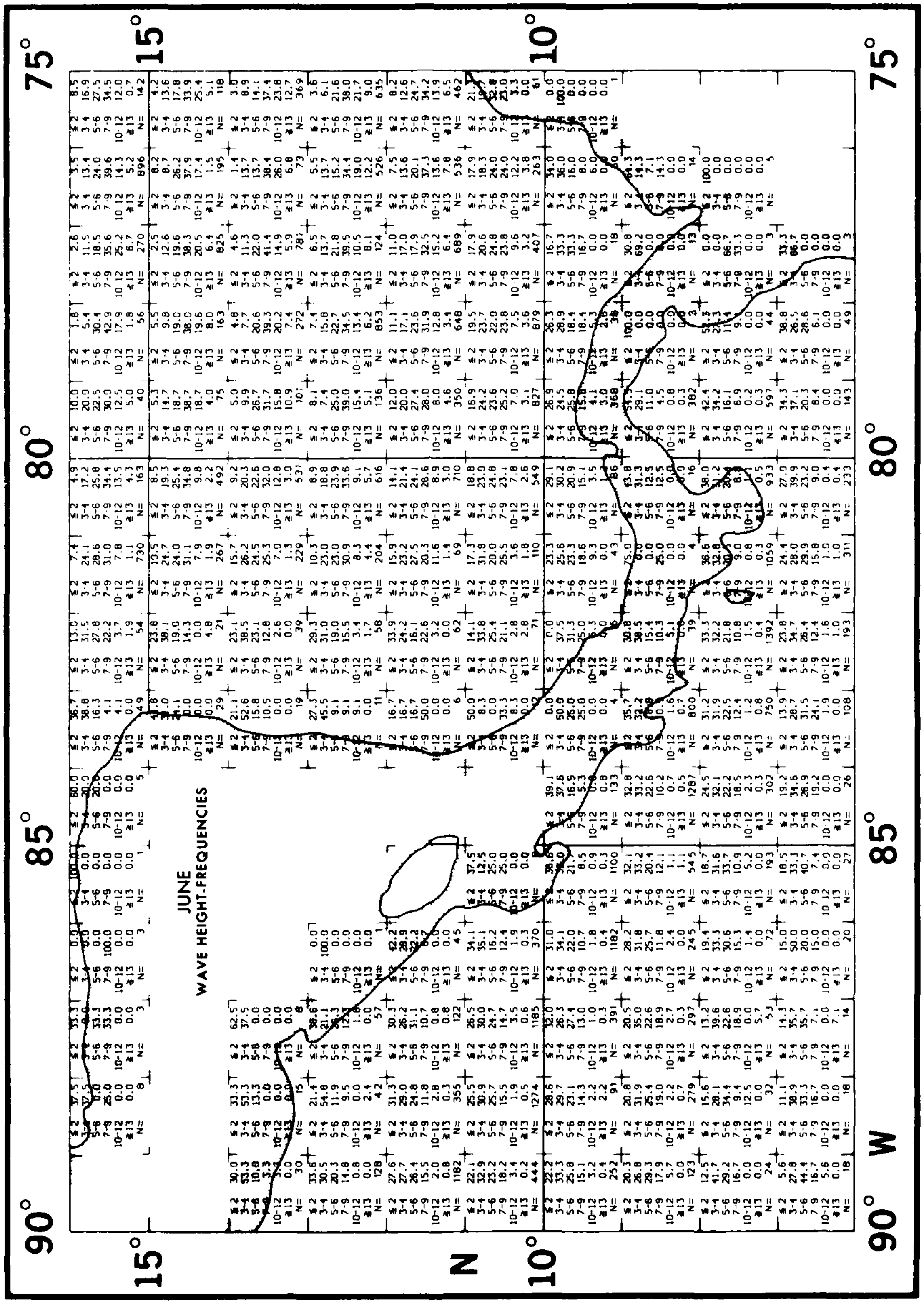
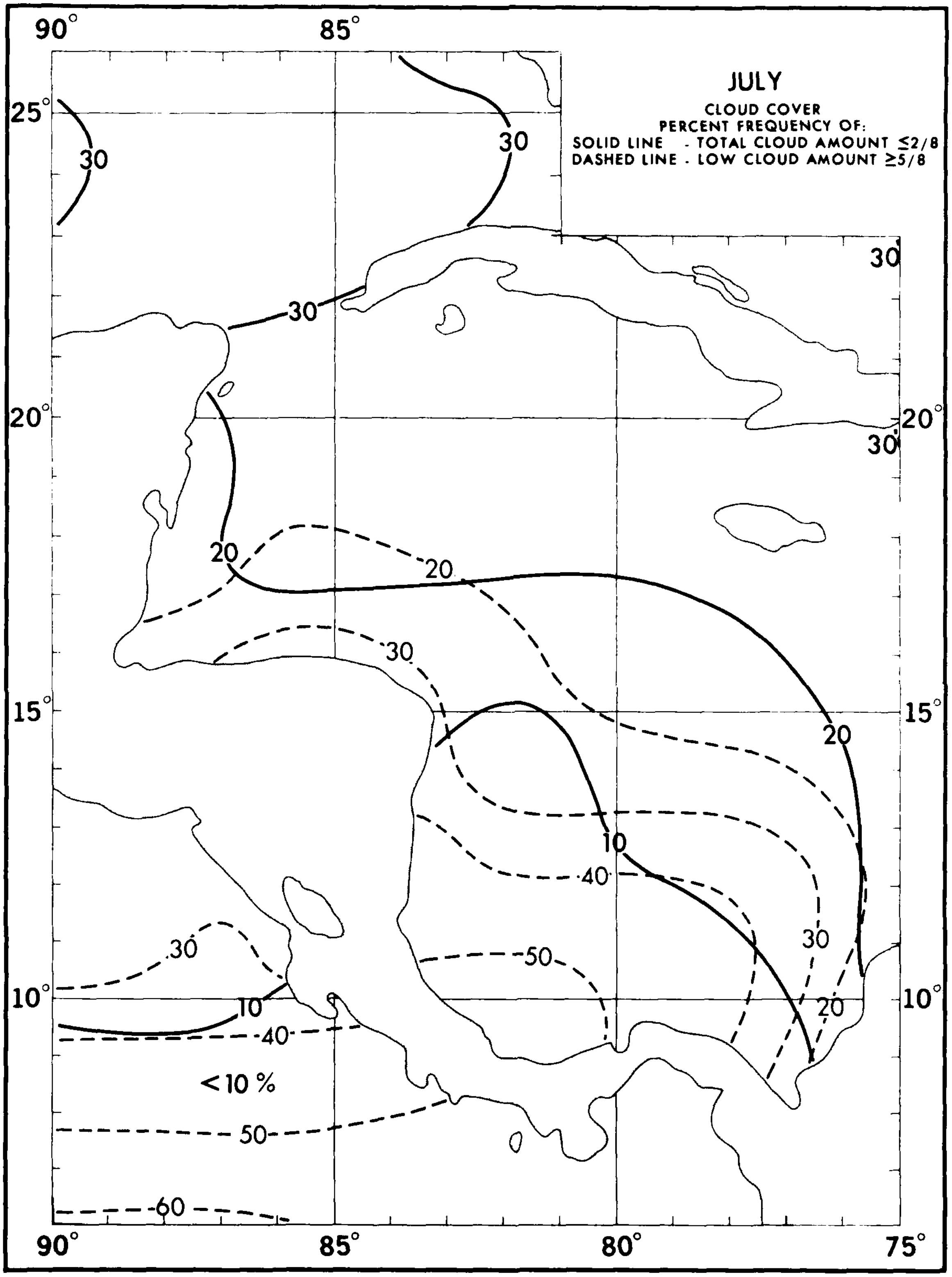
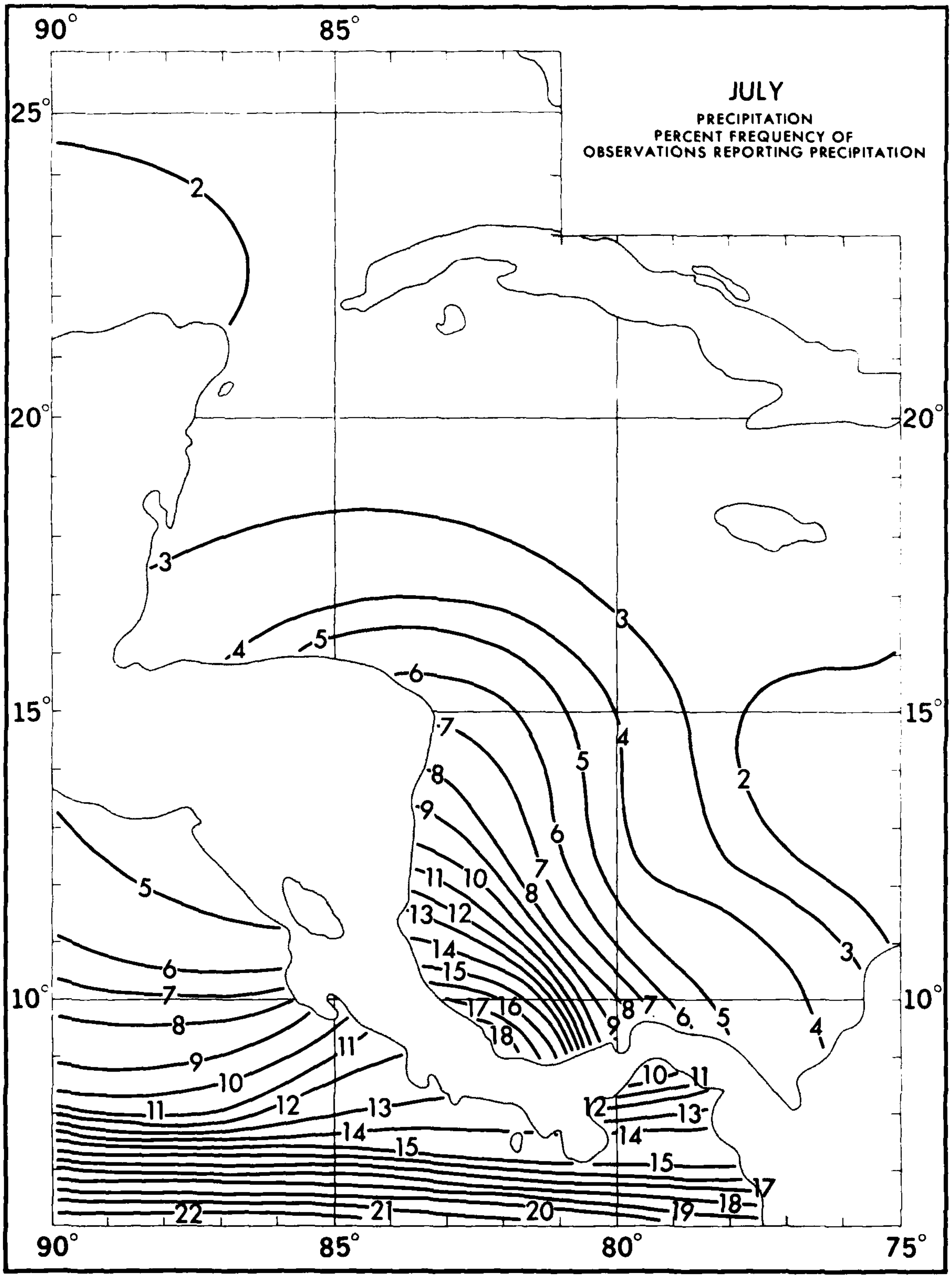
82
83
81
83
82
83
83
81
82
82
80


JUNE
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°
<10 %

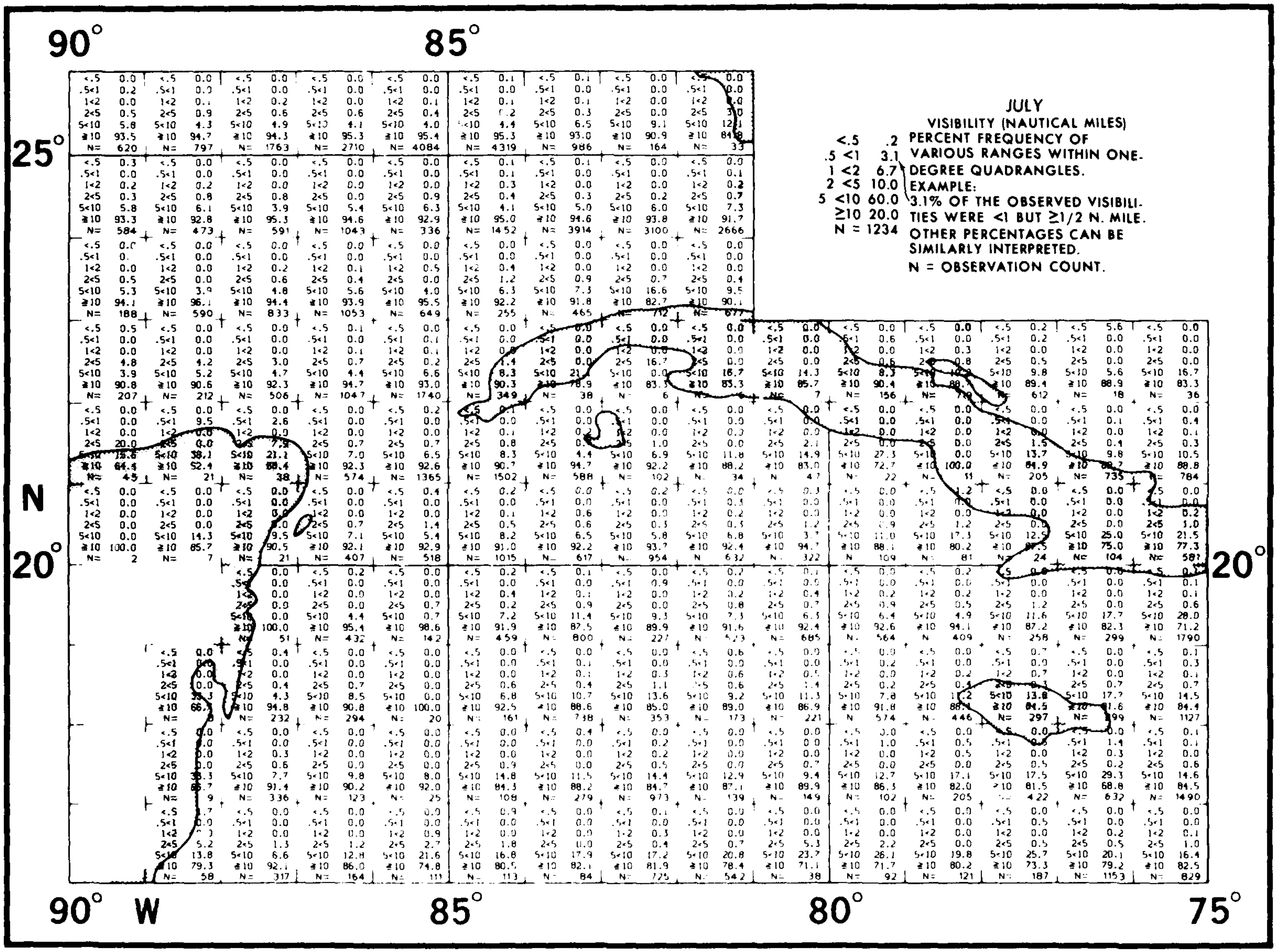

JUNE
WAVE HEIGHT-FREQUENCIES
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
90°
85°
80°
75°
25°
20°
N
W

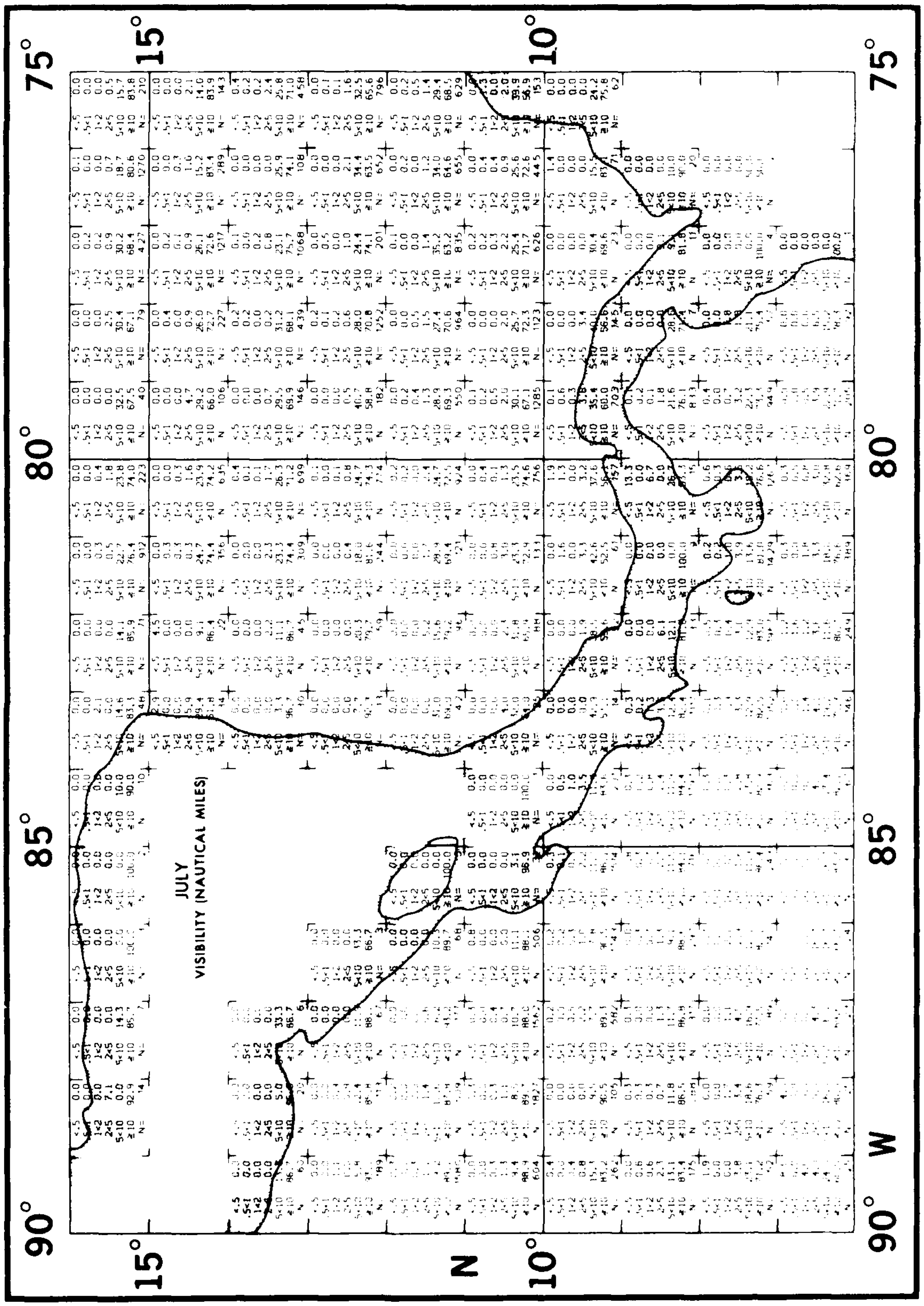

JUNE
WAVE HEIGHT-FREQUENCIES
75°
80°
85°
90°
W
15°
10°
N

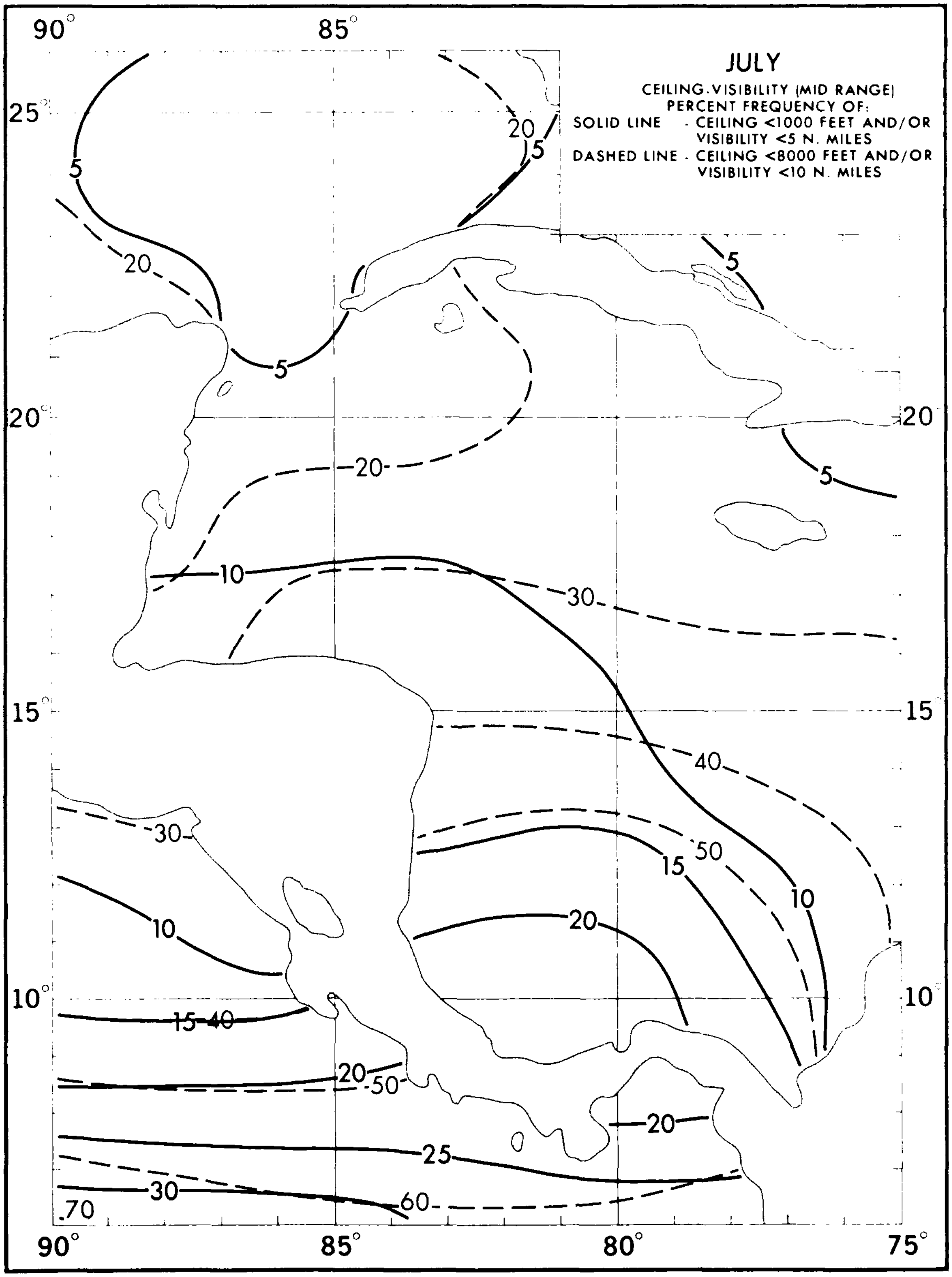

JULY
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°
30
20
10
40
50
60
<10 %



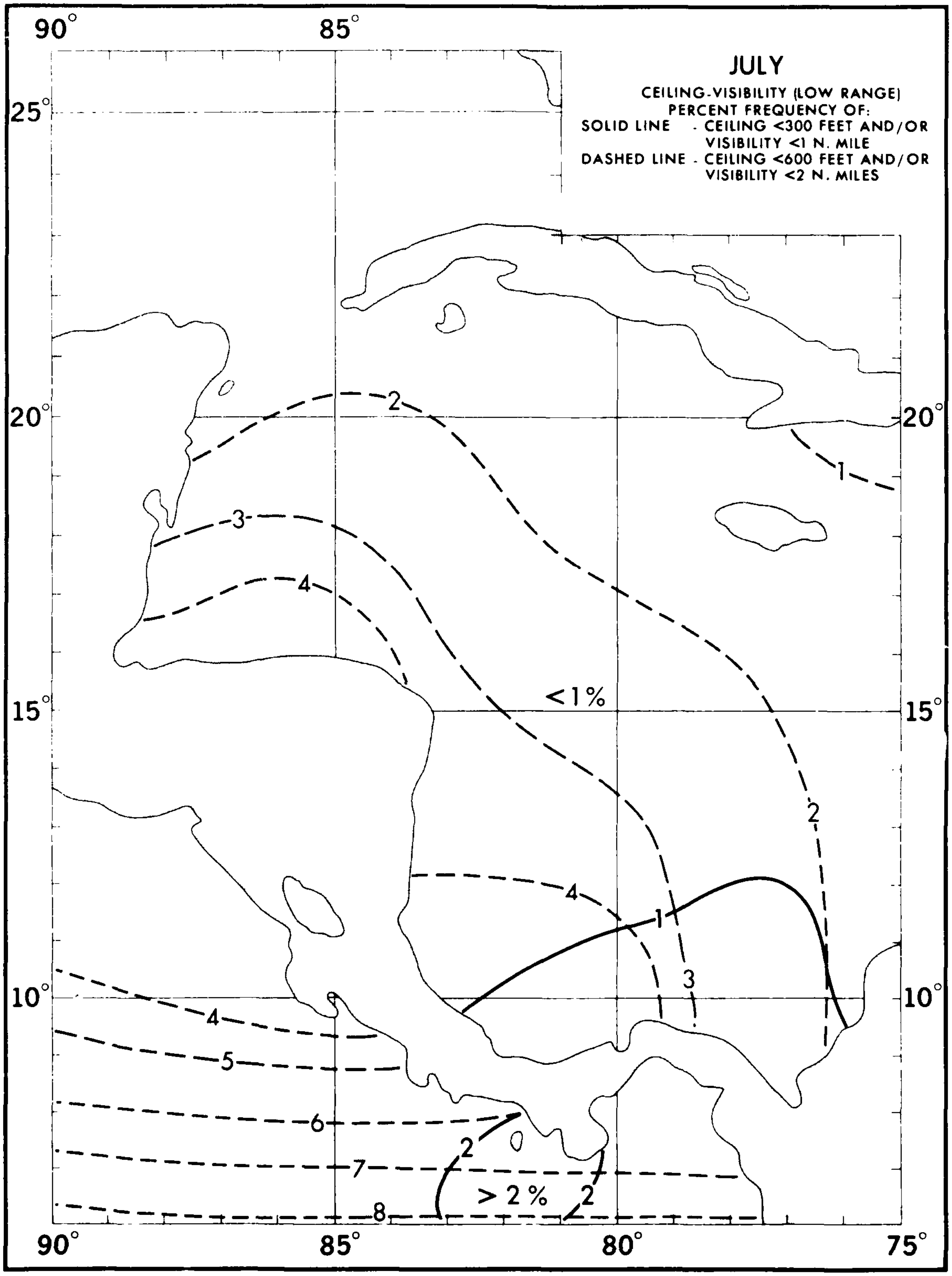
JULY
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°


JULY
VISIBILITY (NAUTICAL MILES)
<.5 .2 PERCENT FREQUENCY OF
.5 <1 3.1 VARIOUS RANGES WITHIN ONE-
1 <2 6.7 DEGREE QUADRANGLES.
2 <5 10.0 EXAMPLE:
5 <10 60.0 3.1% OF THE OBSERVED VISIBILI-
≥10 20.0 TIES WERE <1 BUT ≥1/2 N. MILE.
N = 1234 OTHER PERCENTAGES CAN BE
SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
25°
N
20°
20°
90° W
85°
80°
75°

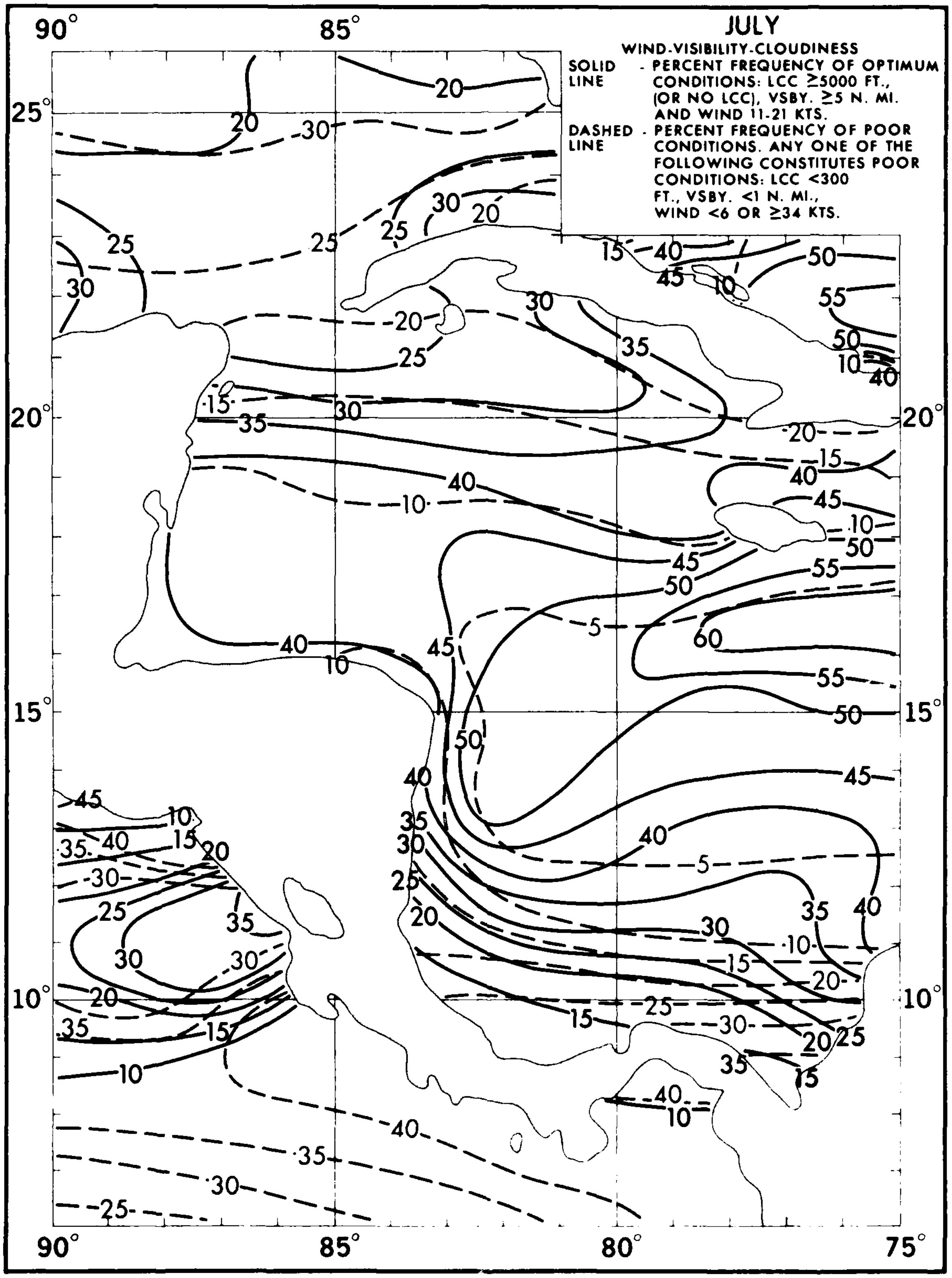

JULY
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
90° W
15°
10°
N

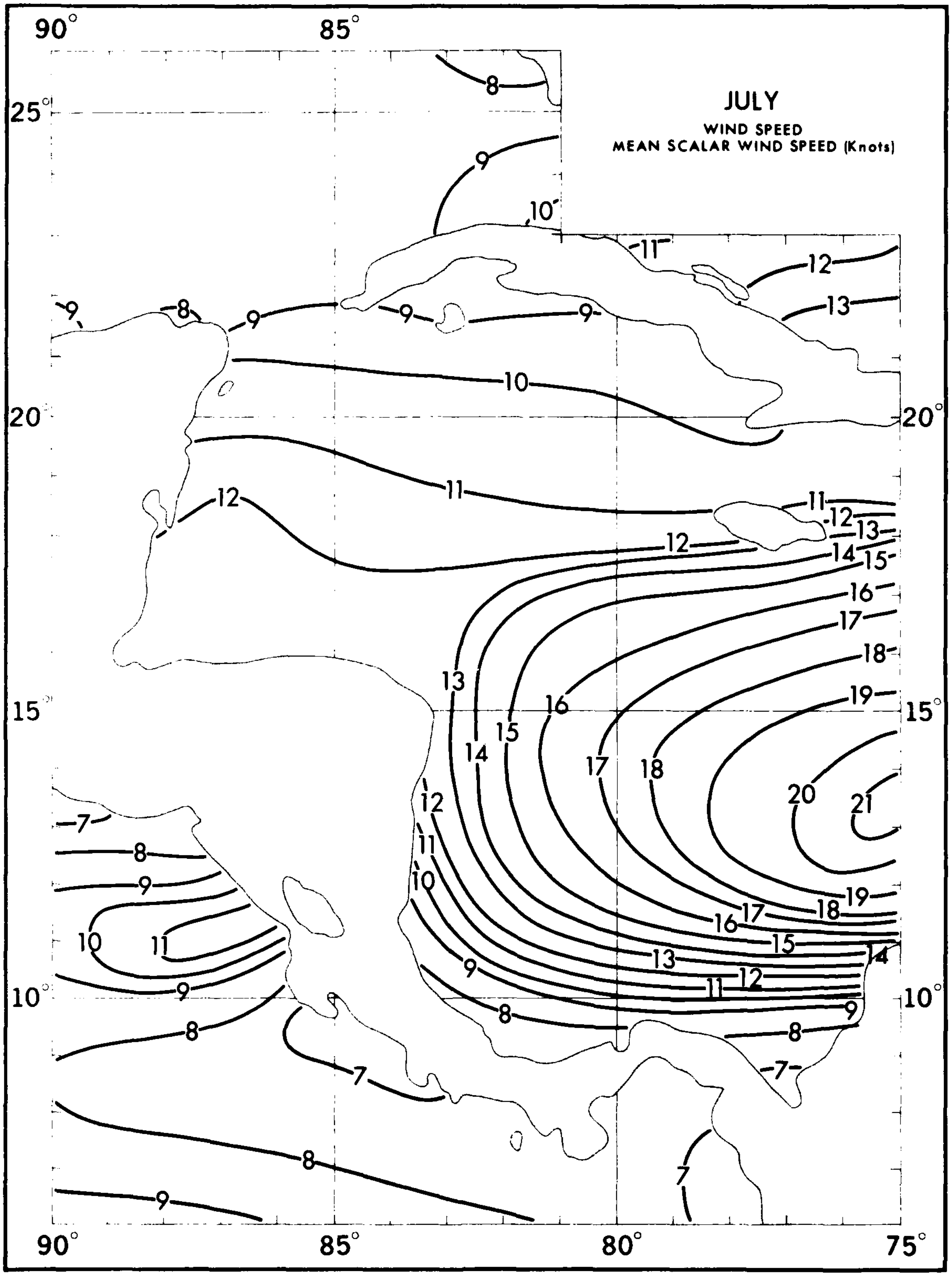


JULY
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
5
20
10
30
40
50
15
25
60
70

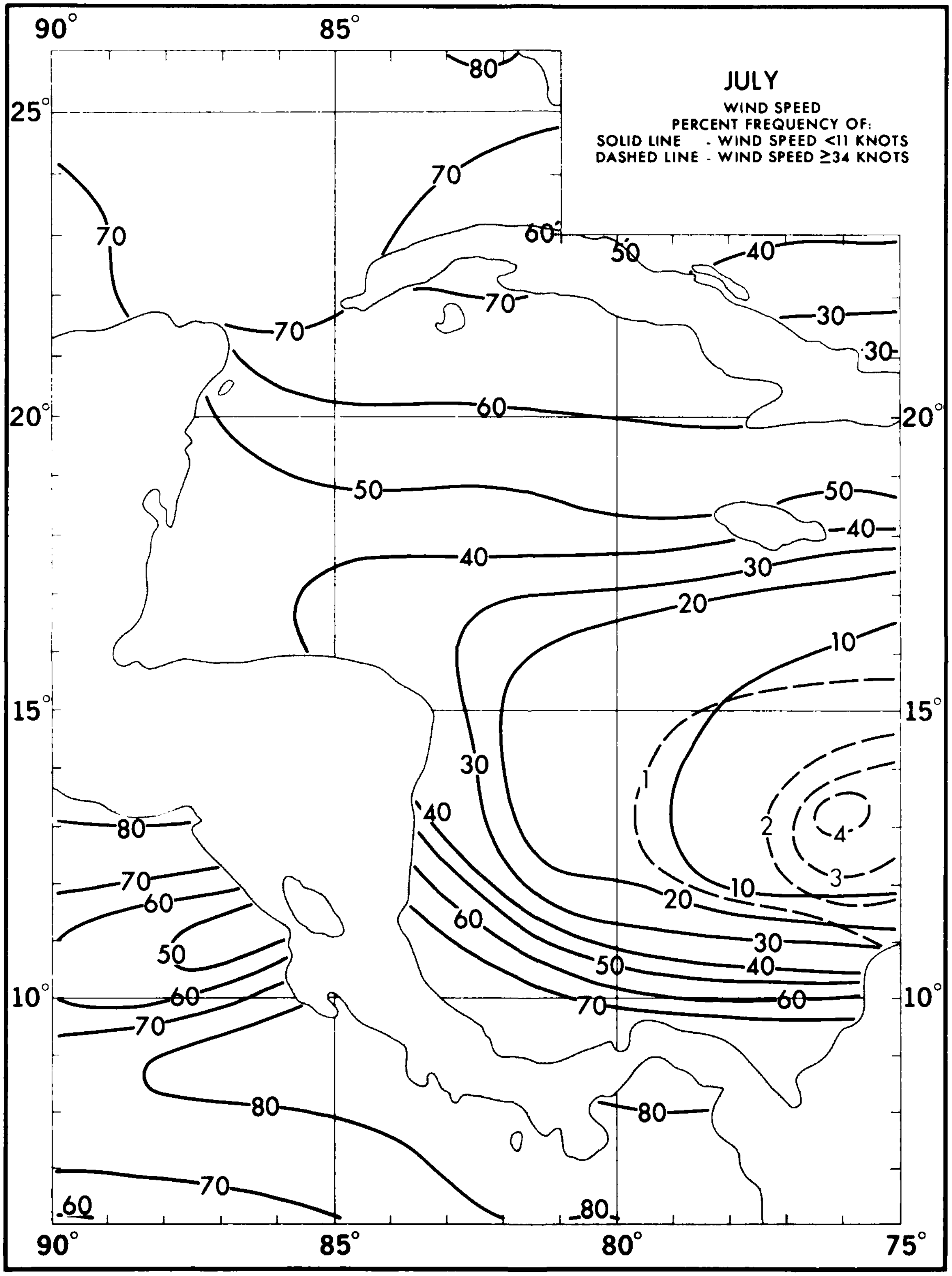


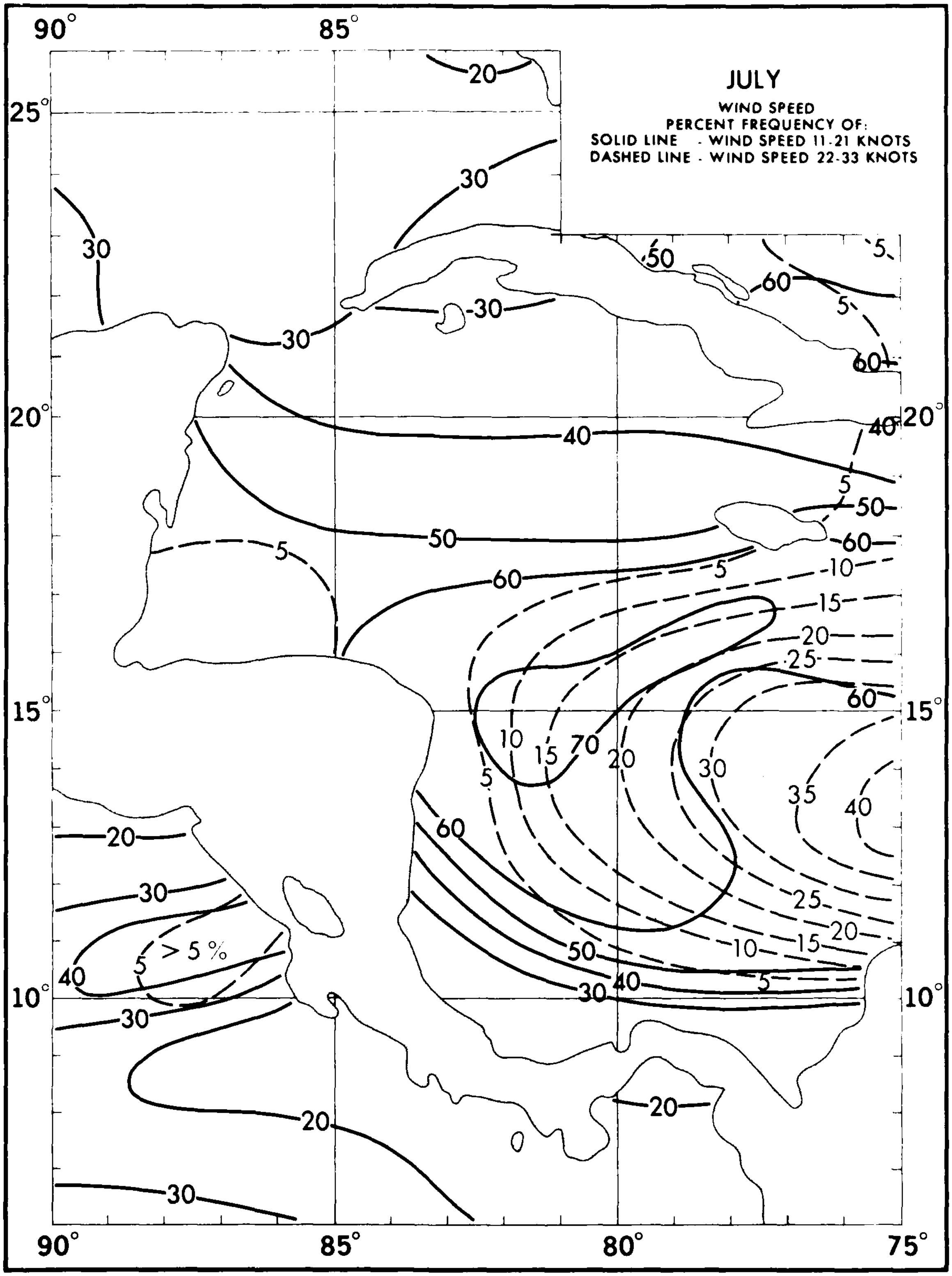
JULY
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
<1%
>2%
1
2
3
4
5
6
7
8

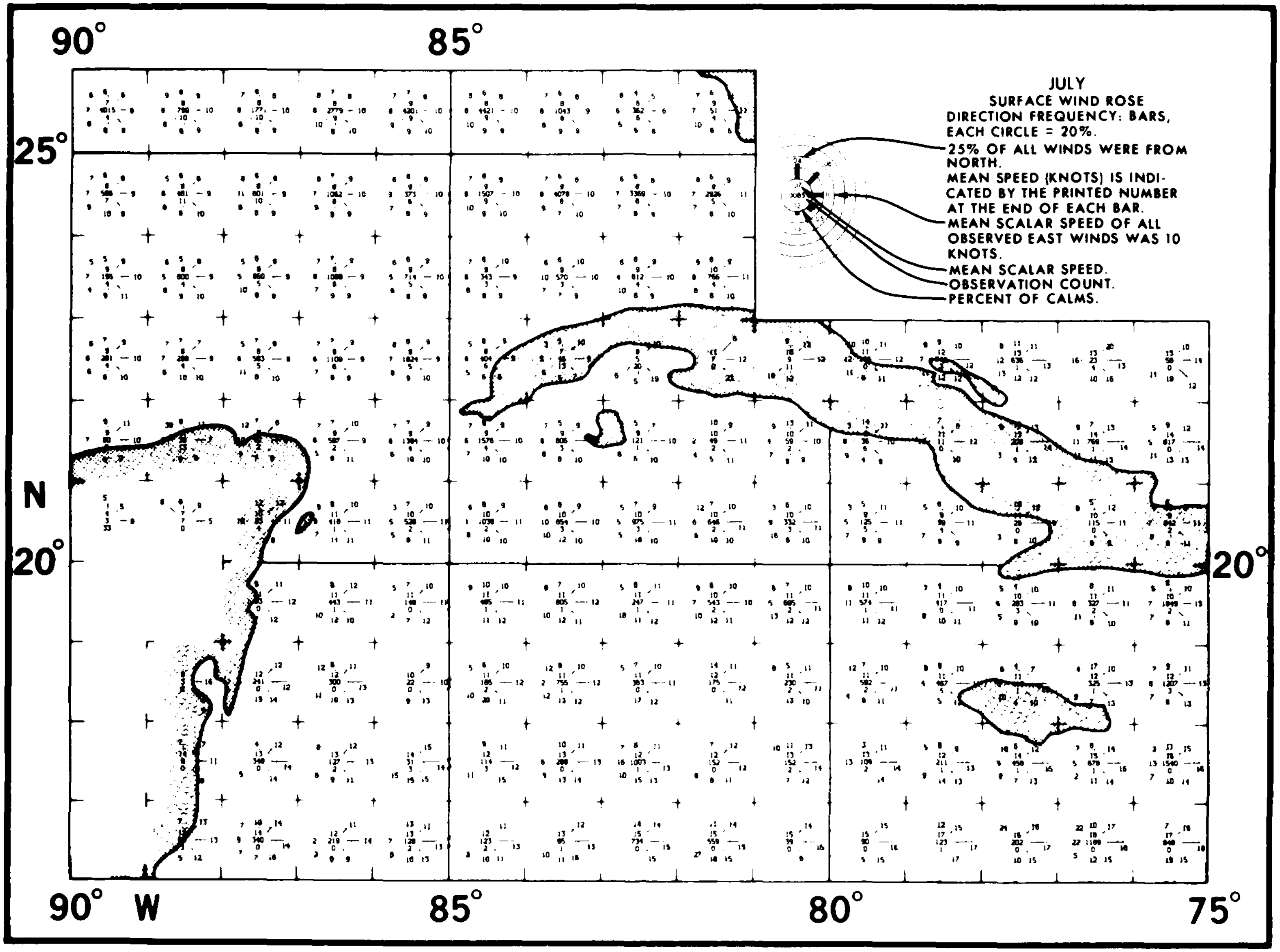

JULY
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°

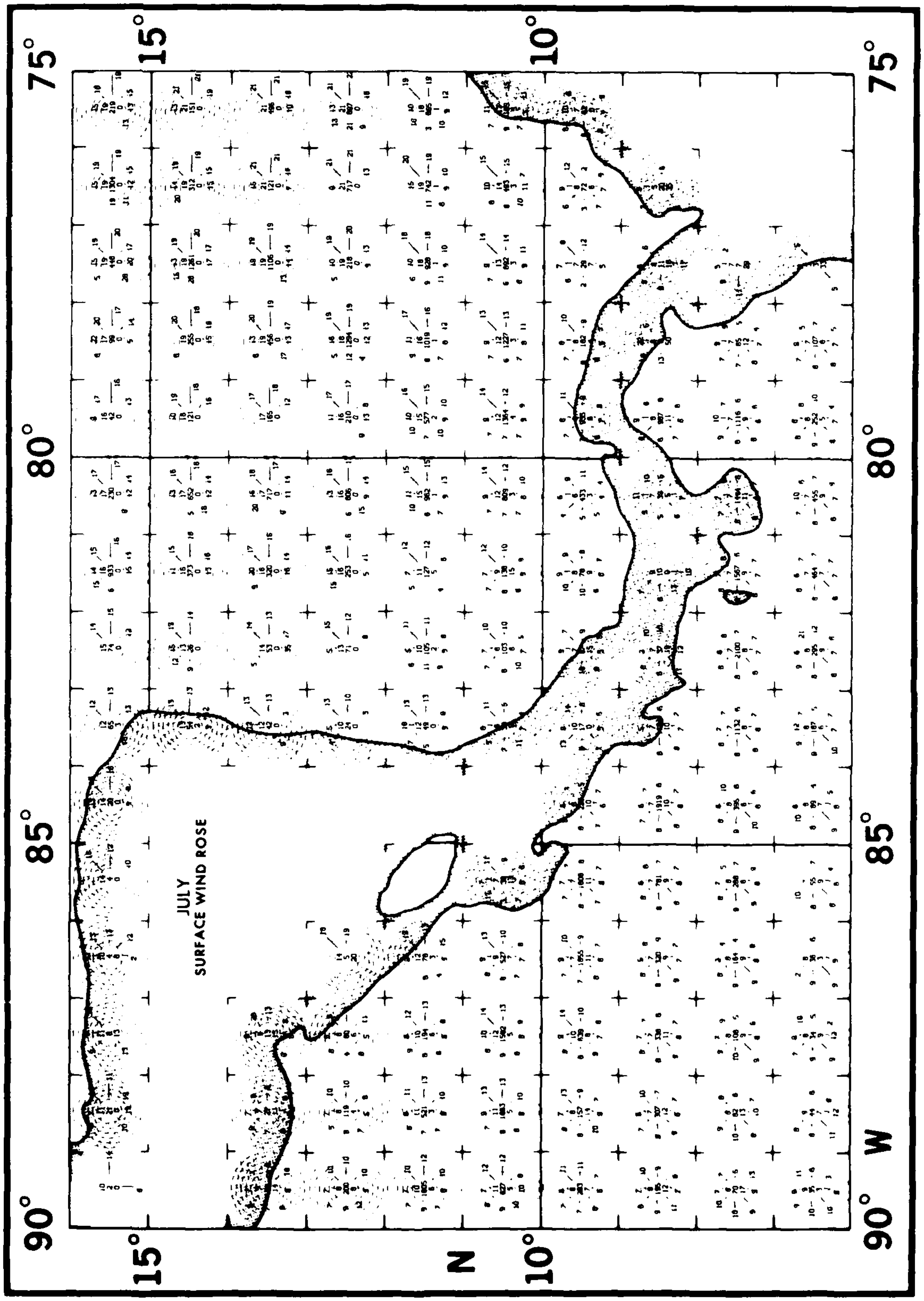


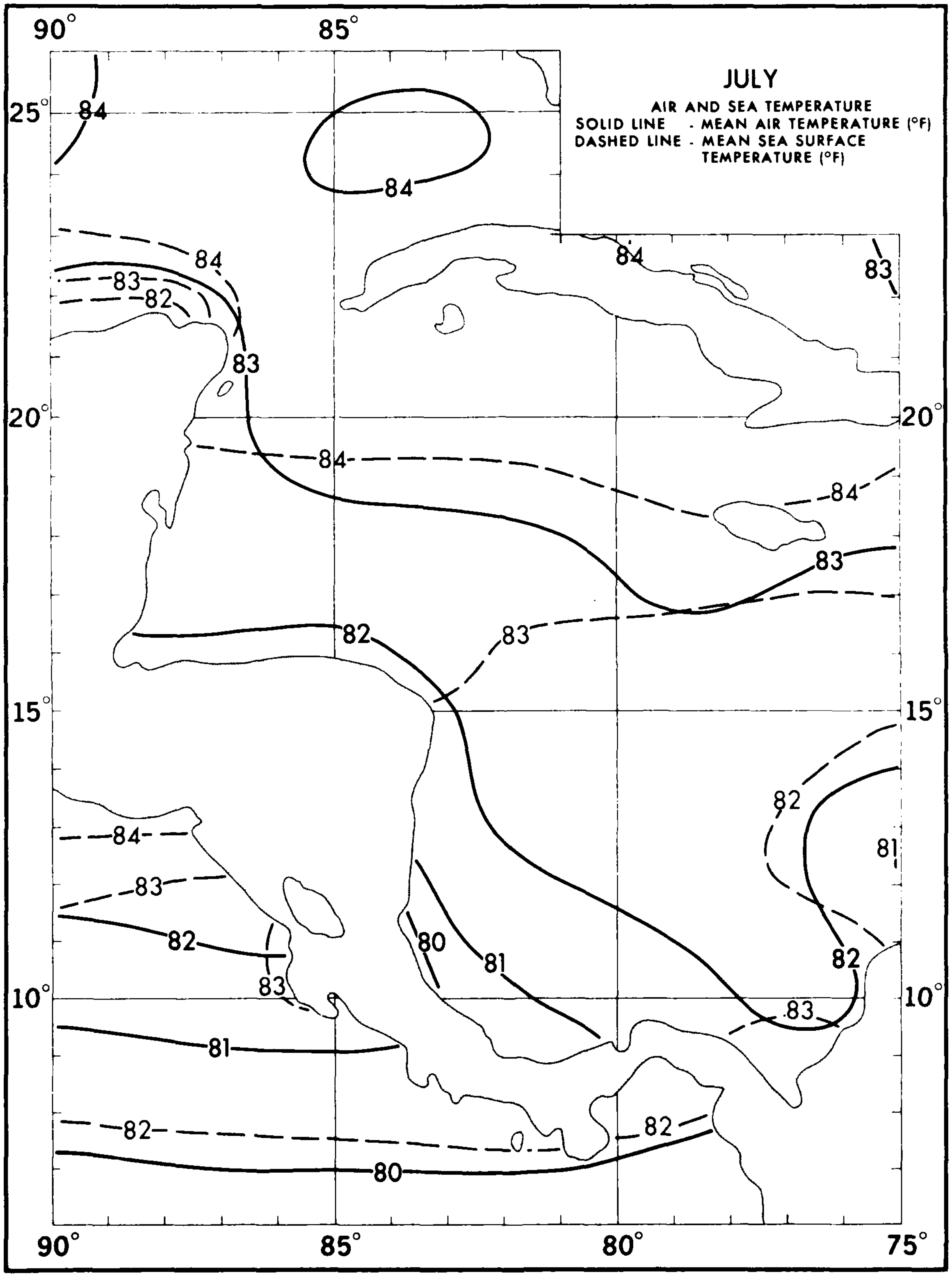
JULY
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°

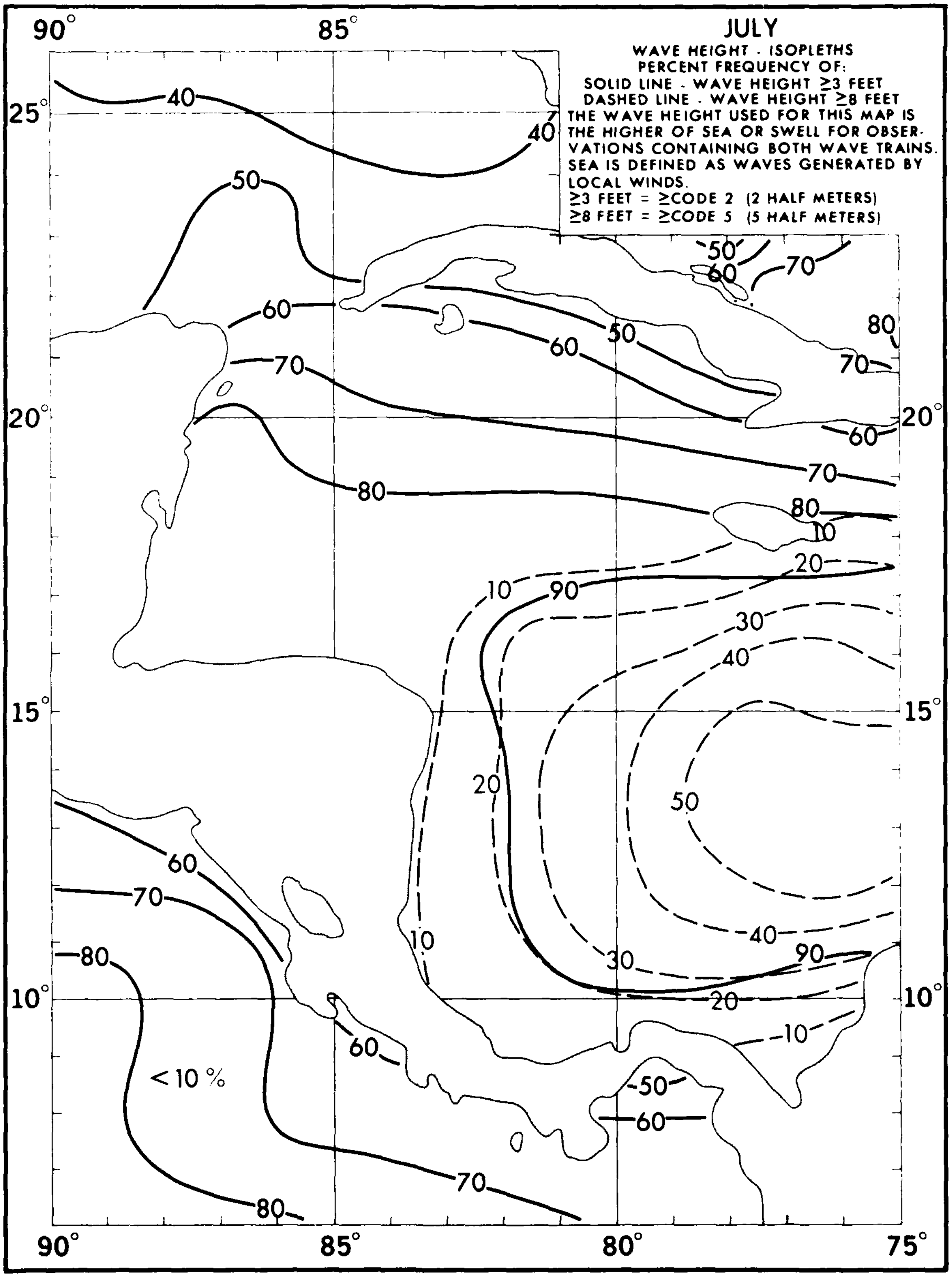

JULY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°


JULY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°
> 5 %

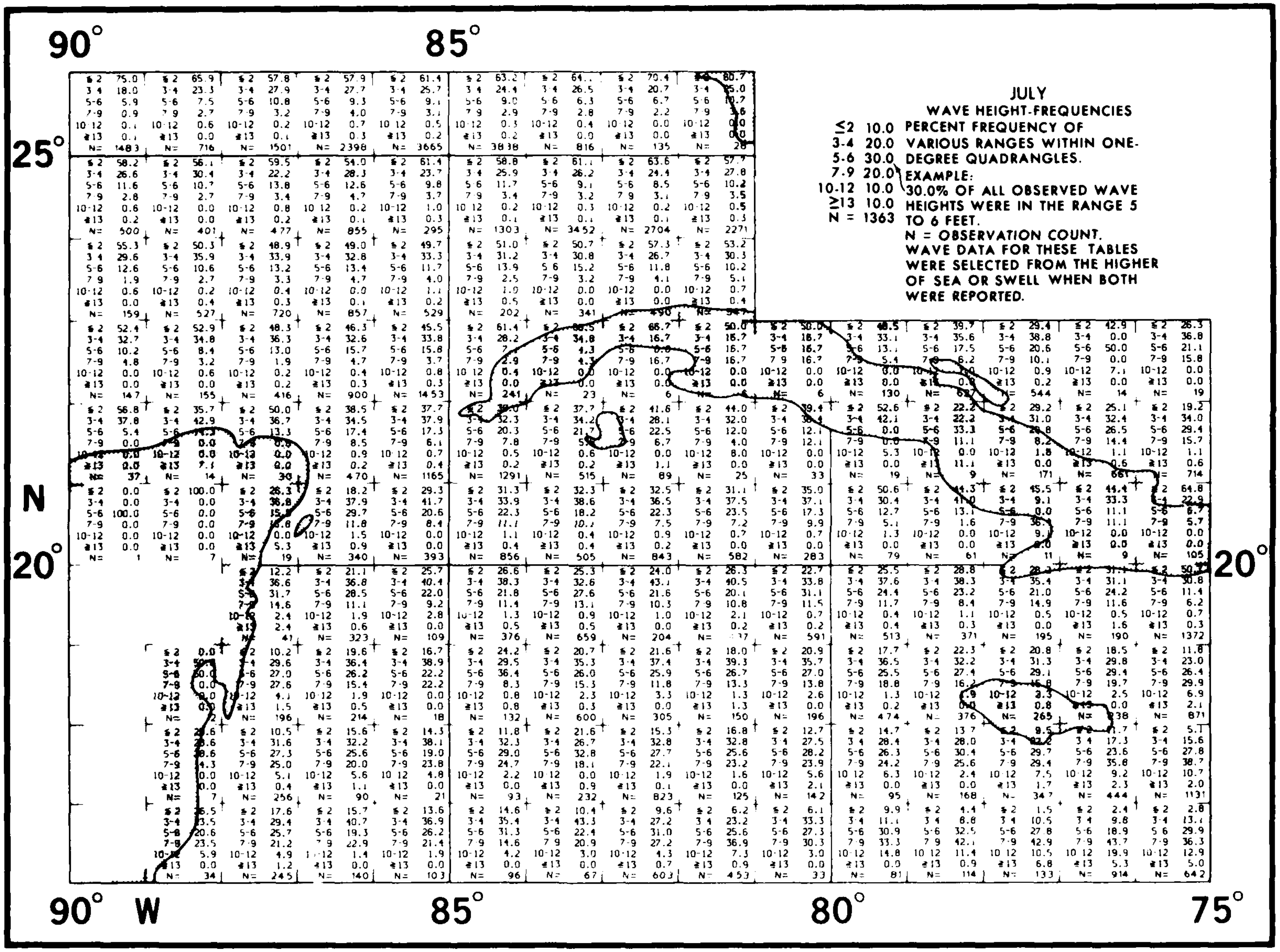

JULY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
80°
75°
25°
20°
N
W

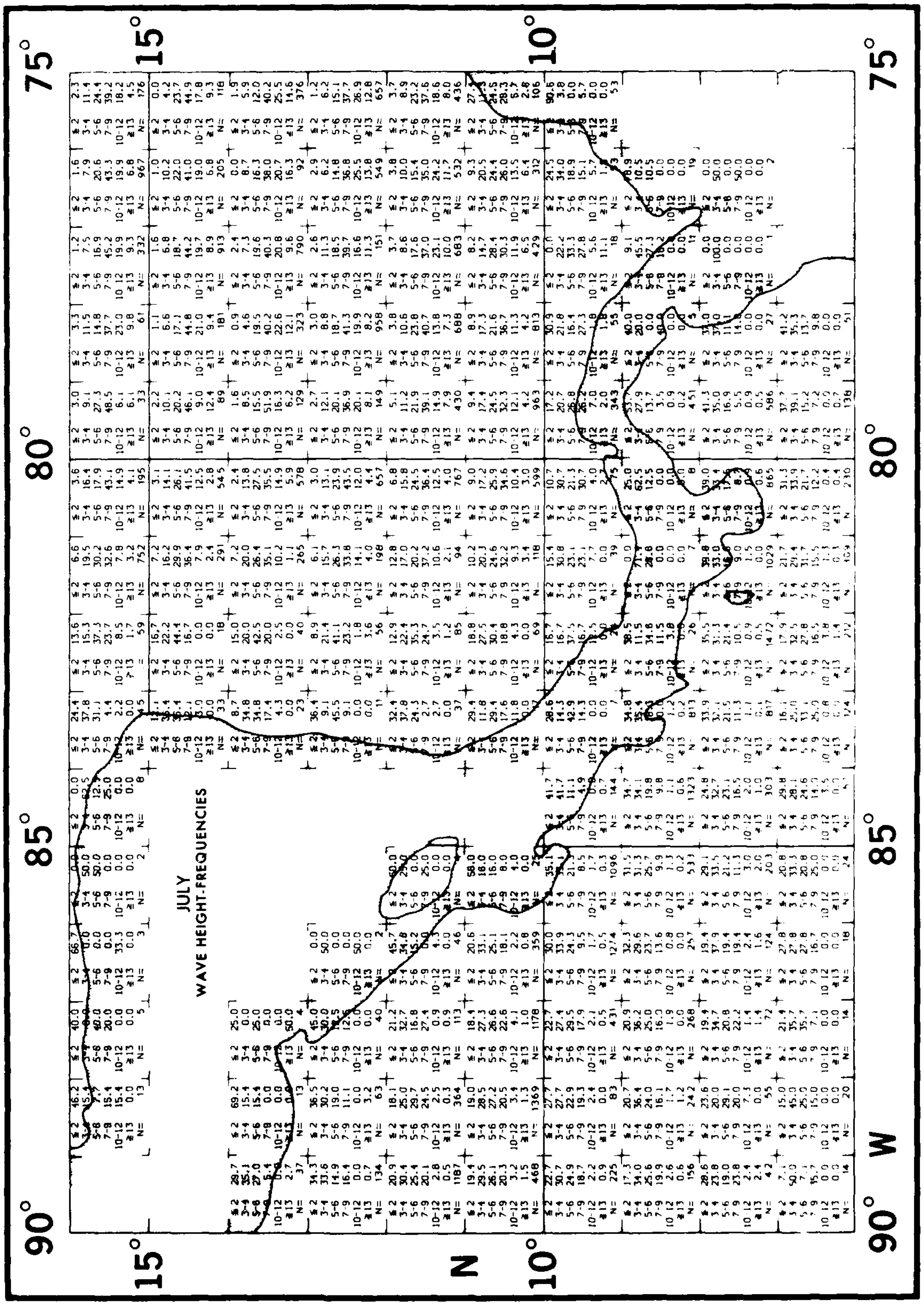

JULY
SURFACE WIND ROSE
75°
80°
85°
90°
15°
10°
N
W

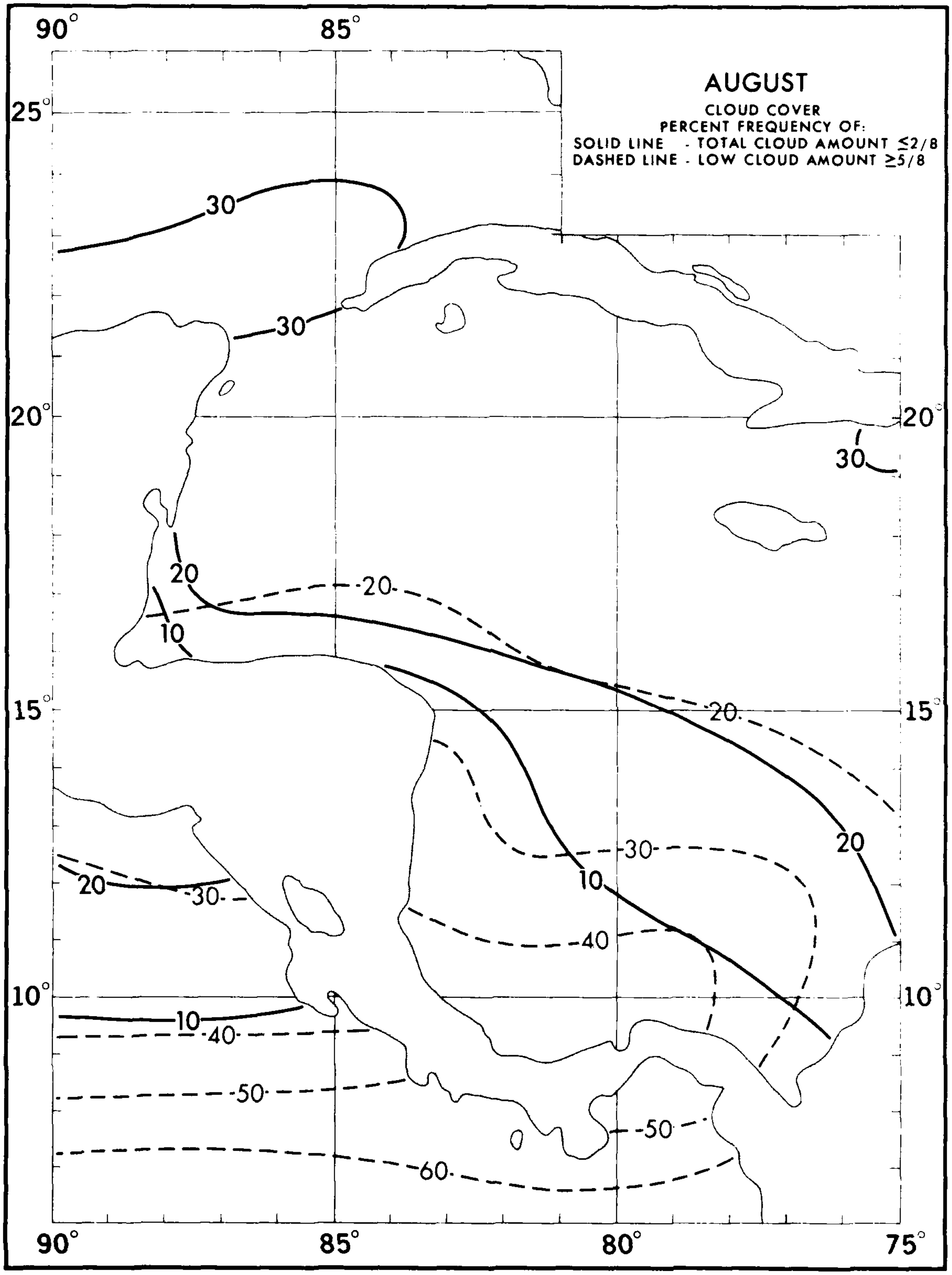

JULY
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°
84
83
82
81
80



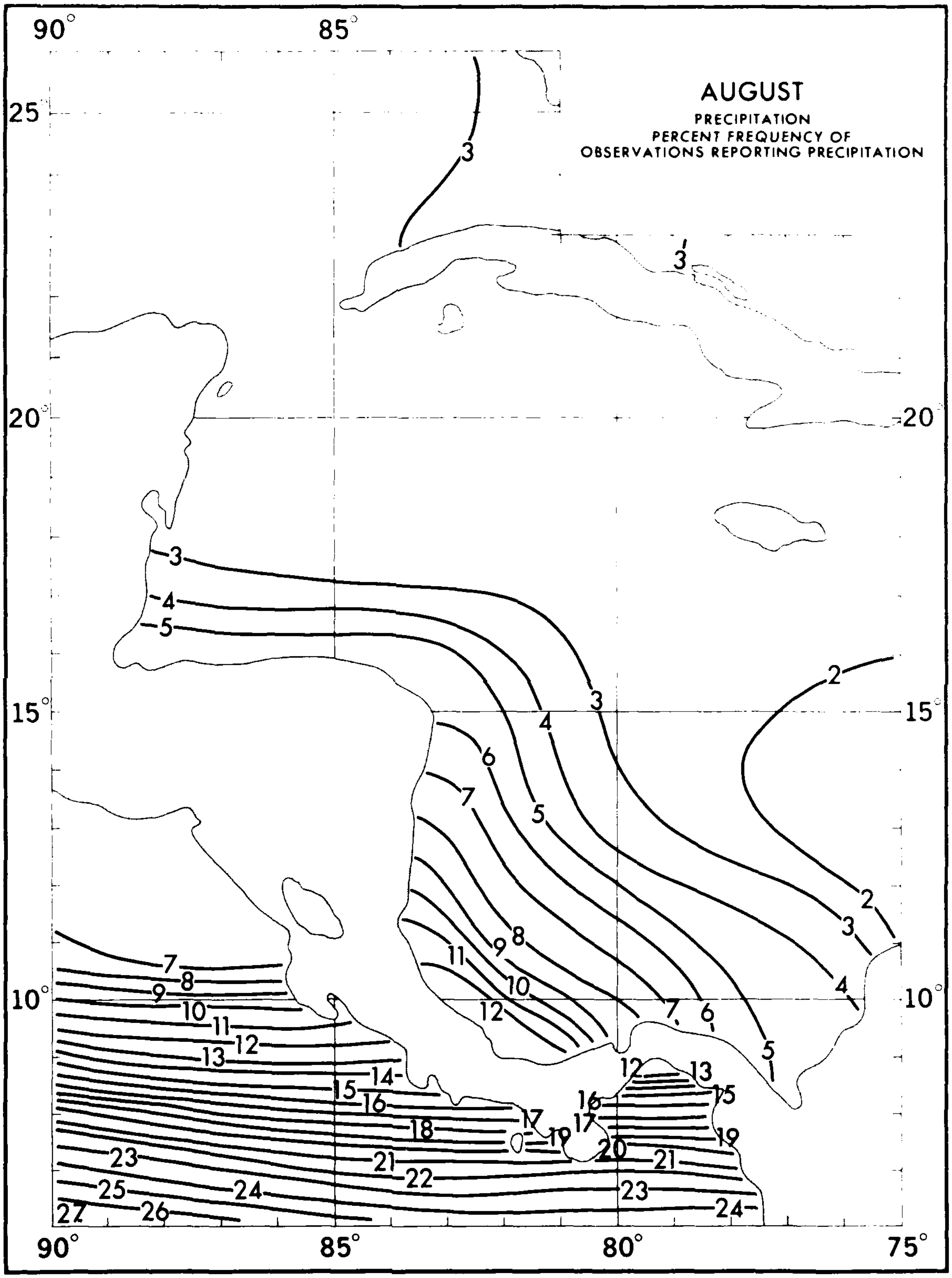
JULY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°
<10 %

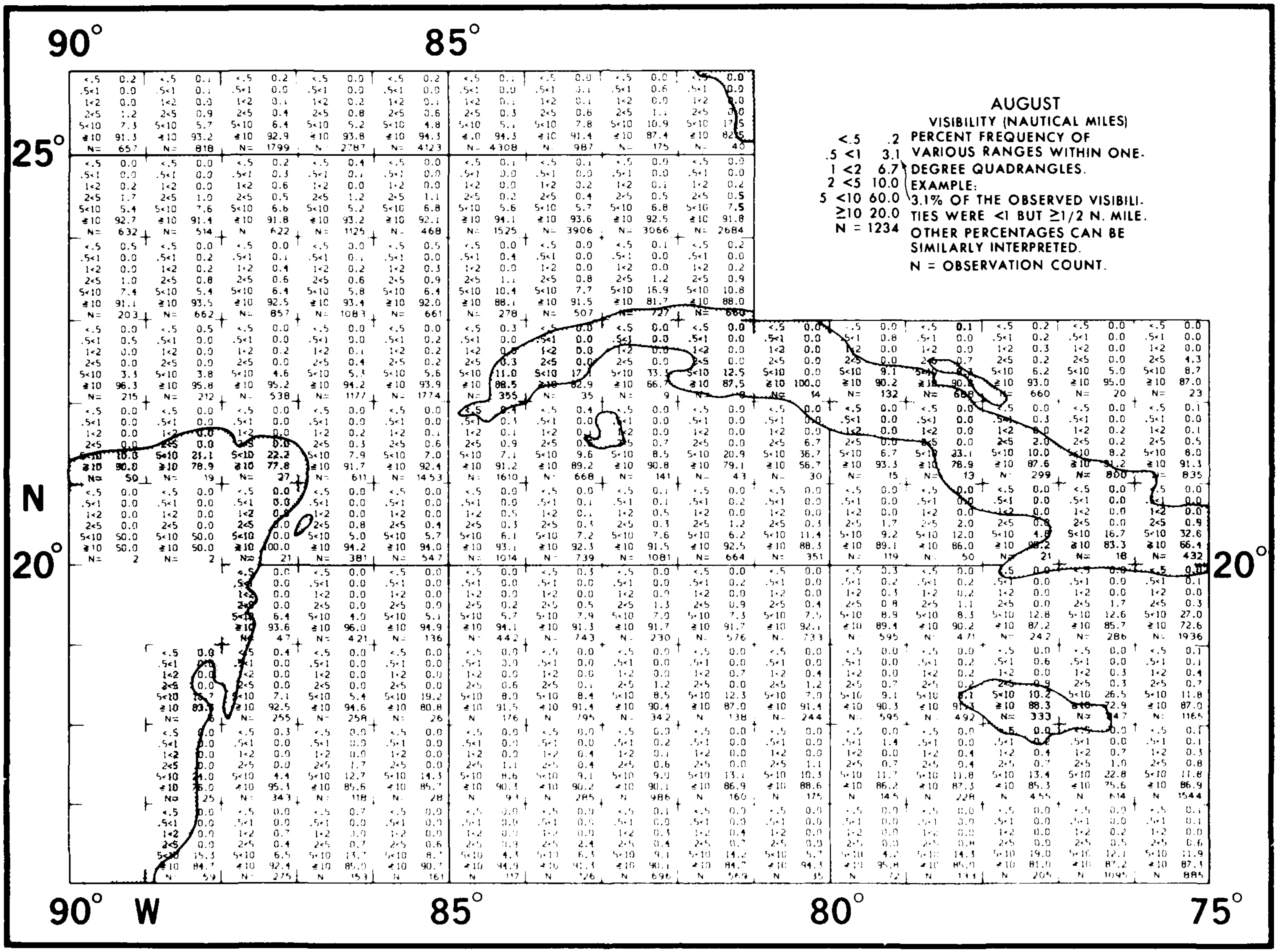

JULY
WAVE HEIGHT-FREQUENCIES
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
90°
85°
25°
N
20°
20°
90° W
85°
80°
75°

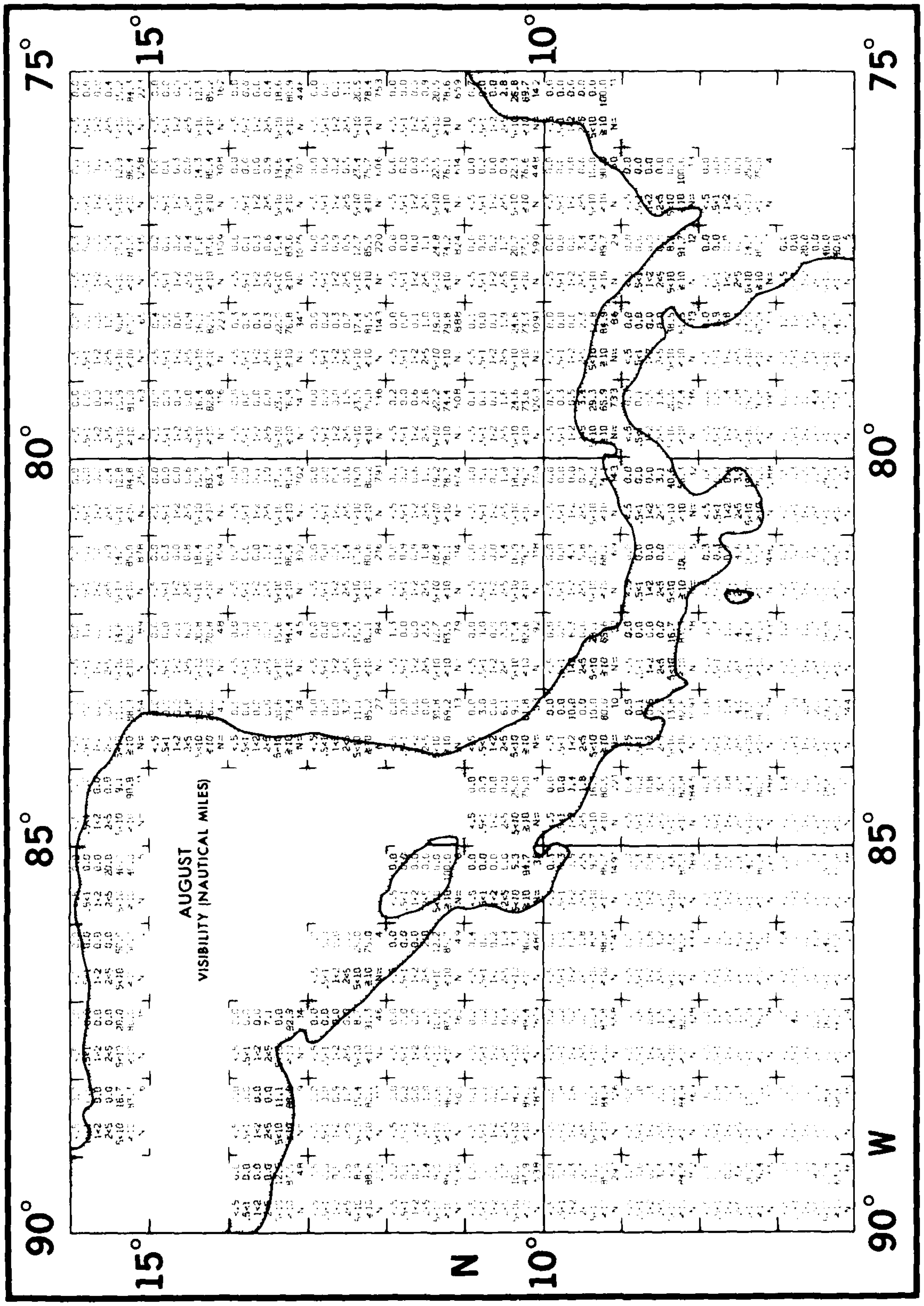

JULY
WAVE HEIGHT-FREQUENCIES
90°
85°
80°
75°
15°
10°
N
W

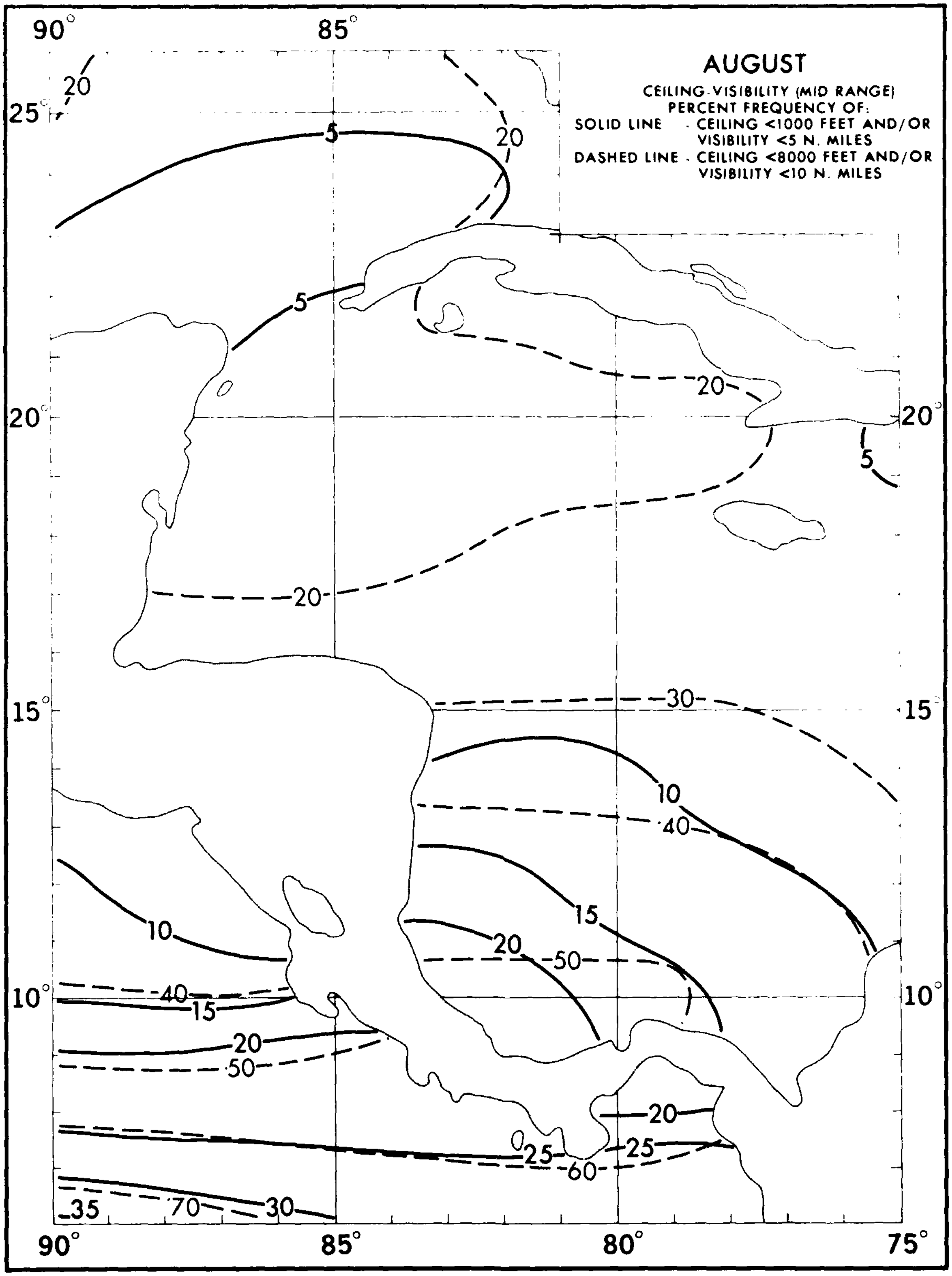


AUGUST
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°
30
30
30
20
20
10
20
20
10
30
20
20
30
40
10
40
50
50
60

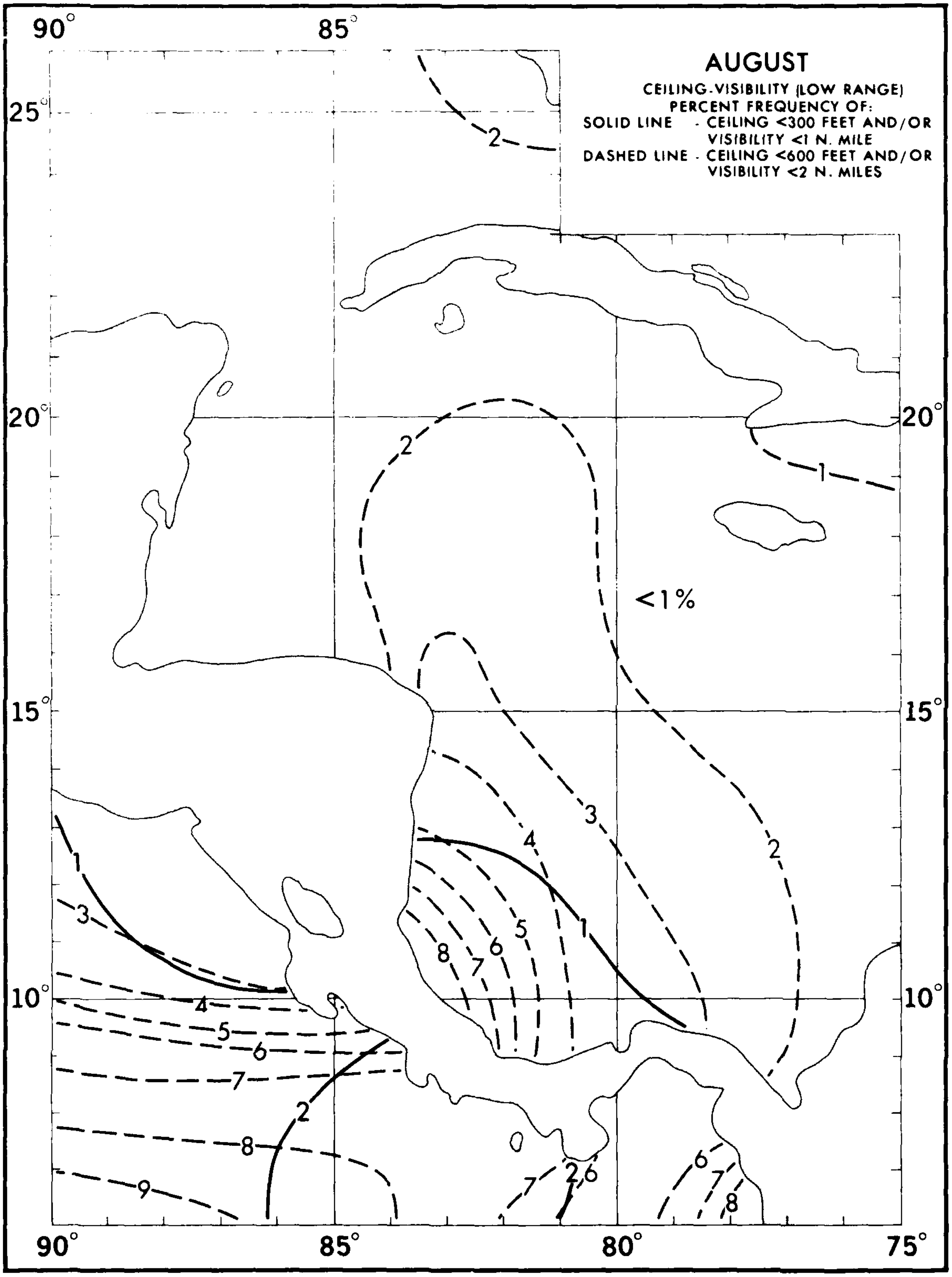

AUGUST
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27

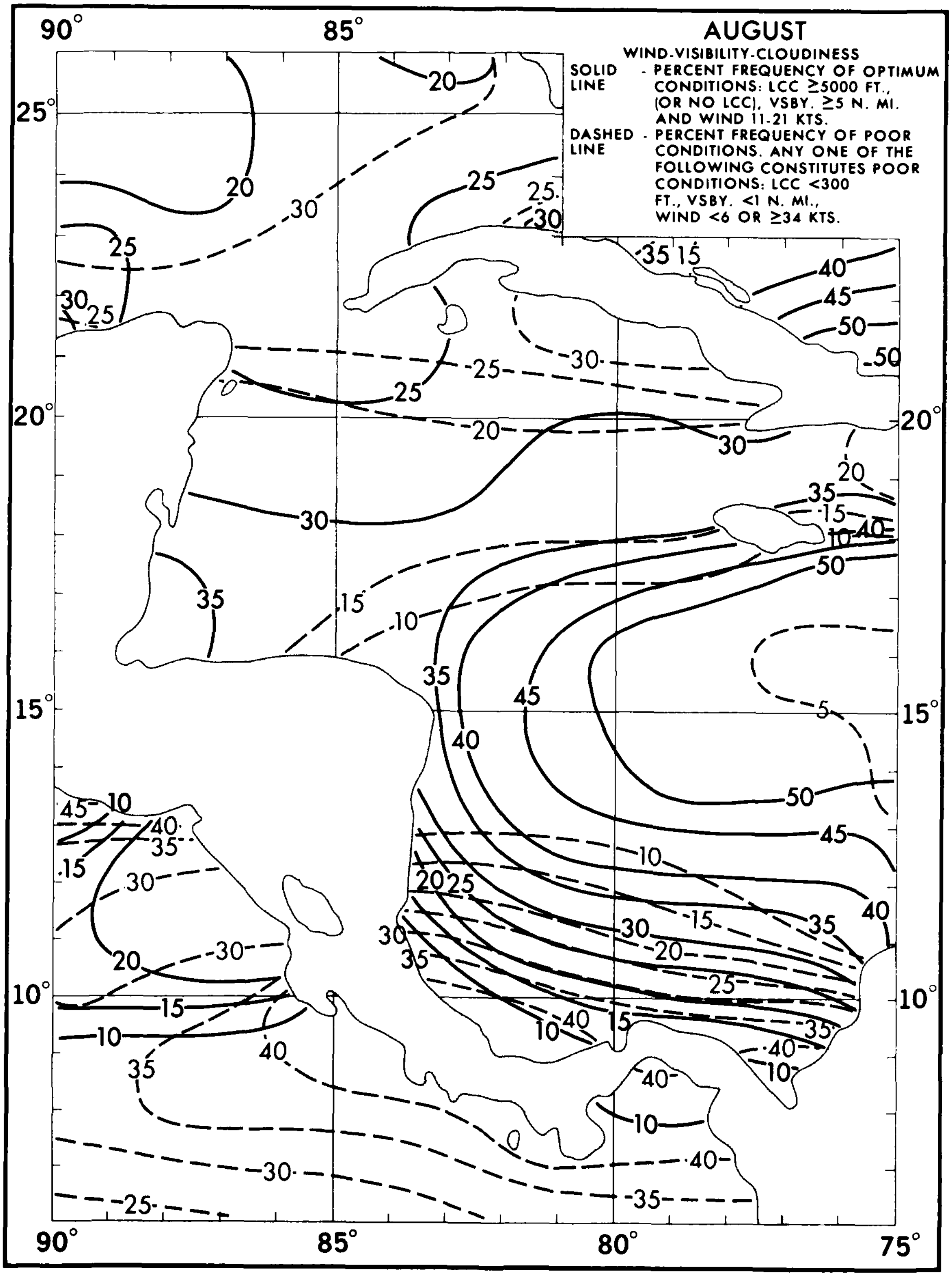

AUGUST
VISIBILITY (NAUTICAL MILES)
<.5 .2 PERCENT FREQUENCY OF
.5 <1 3.1 VARIOUS RANGES WITHIN ONE-
1 <2 6.7 DEGREE QUADRANGLES.
2 <5 10.0 EXAMPLE:
5 <10 60.0 3.1% OF THE OBSERVED VISIBILI-
≥10 20.0 TIES WERE <1 BUT ≥1/2 N. MILE.
N = 1234 OTHER PERCENTAGES CAN BE
SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
80°
75°
W
25°
20°
N


AUGUST
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
10°
N
W

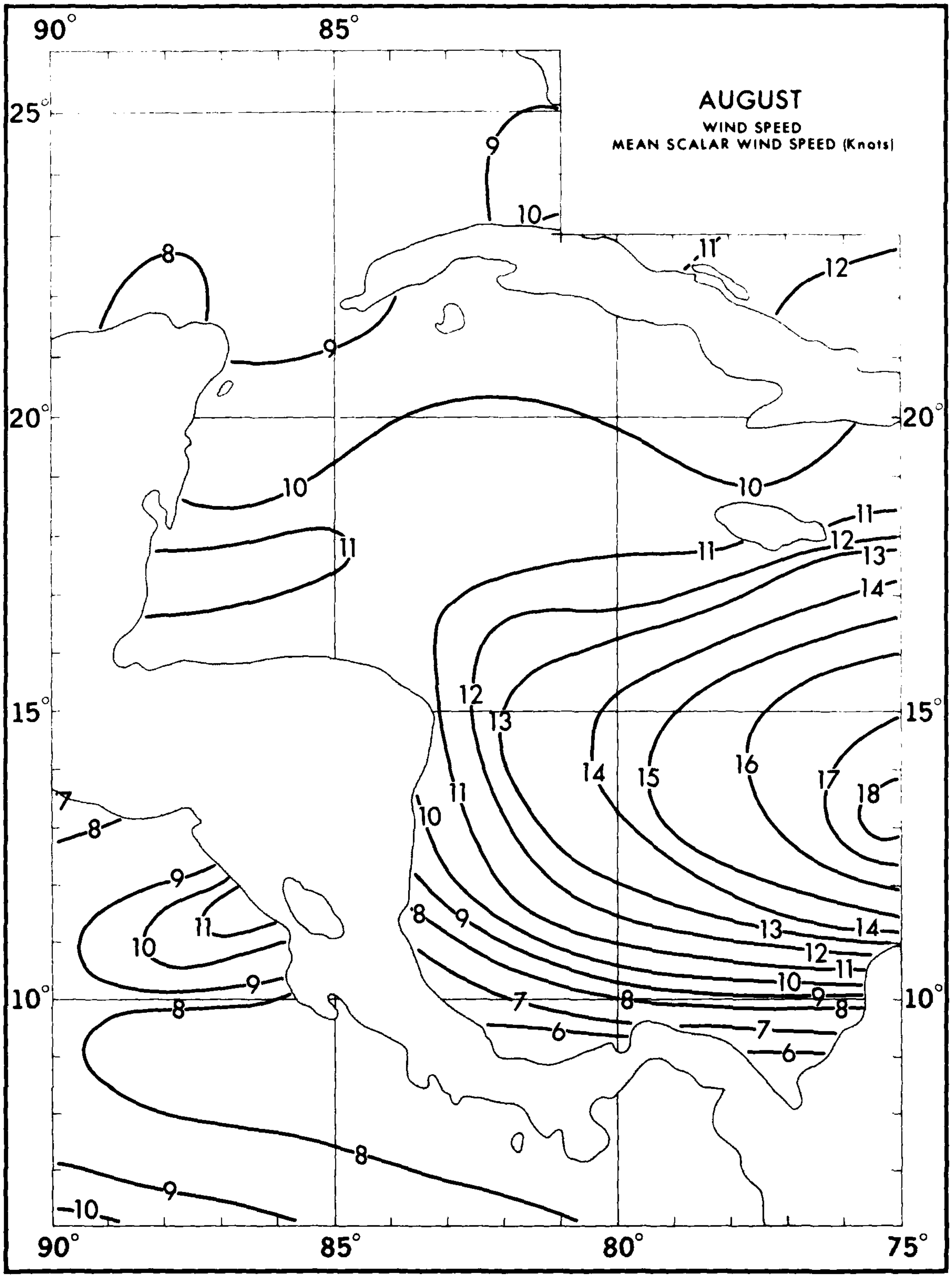


AUGUST
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
5
20
10
15
25
30
35
40
50
60
70

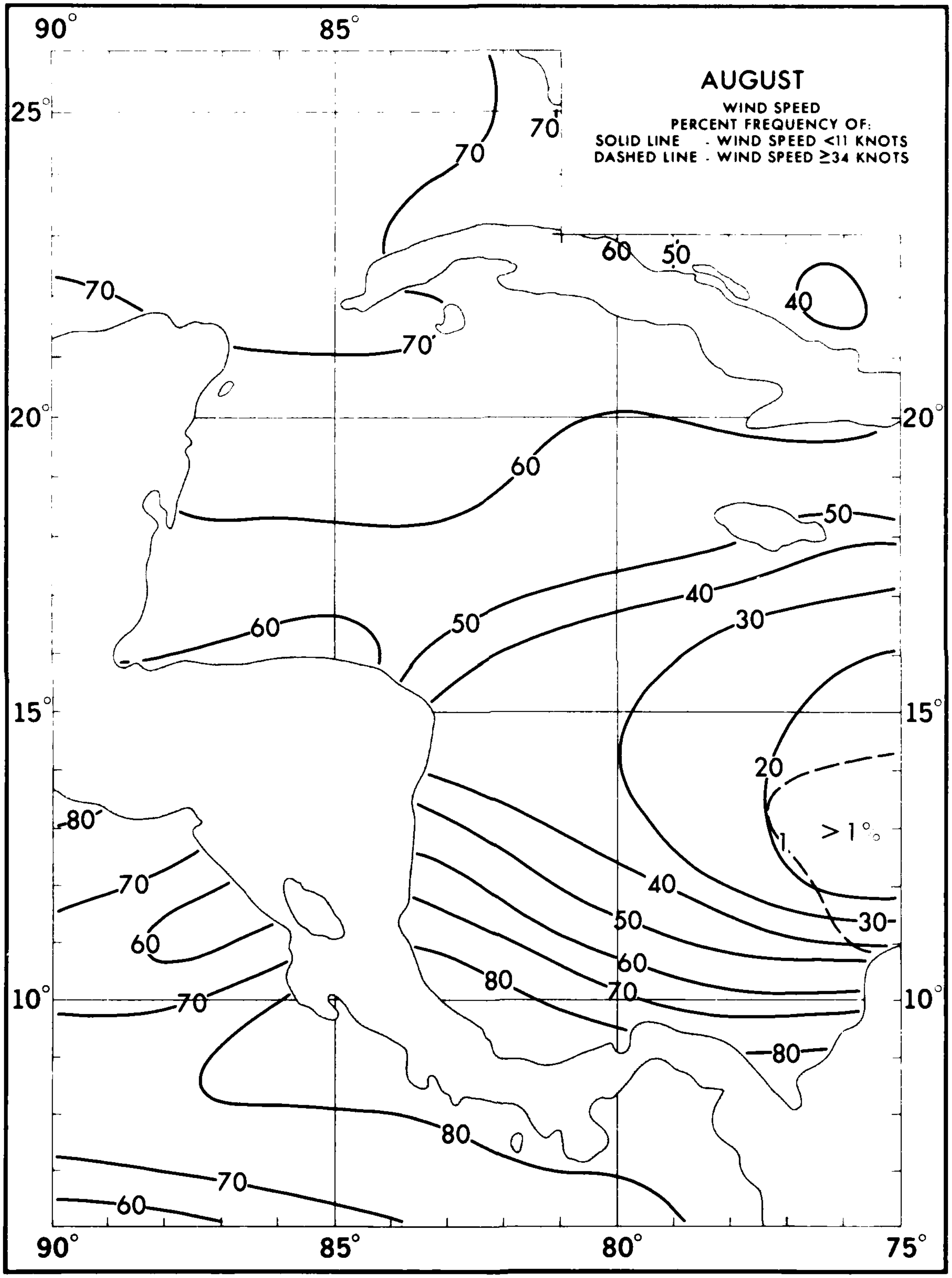

AUGUST
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
<1%
90°
85°
80°
75°
25°
20°
15°
10°

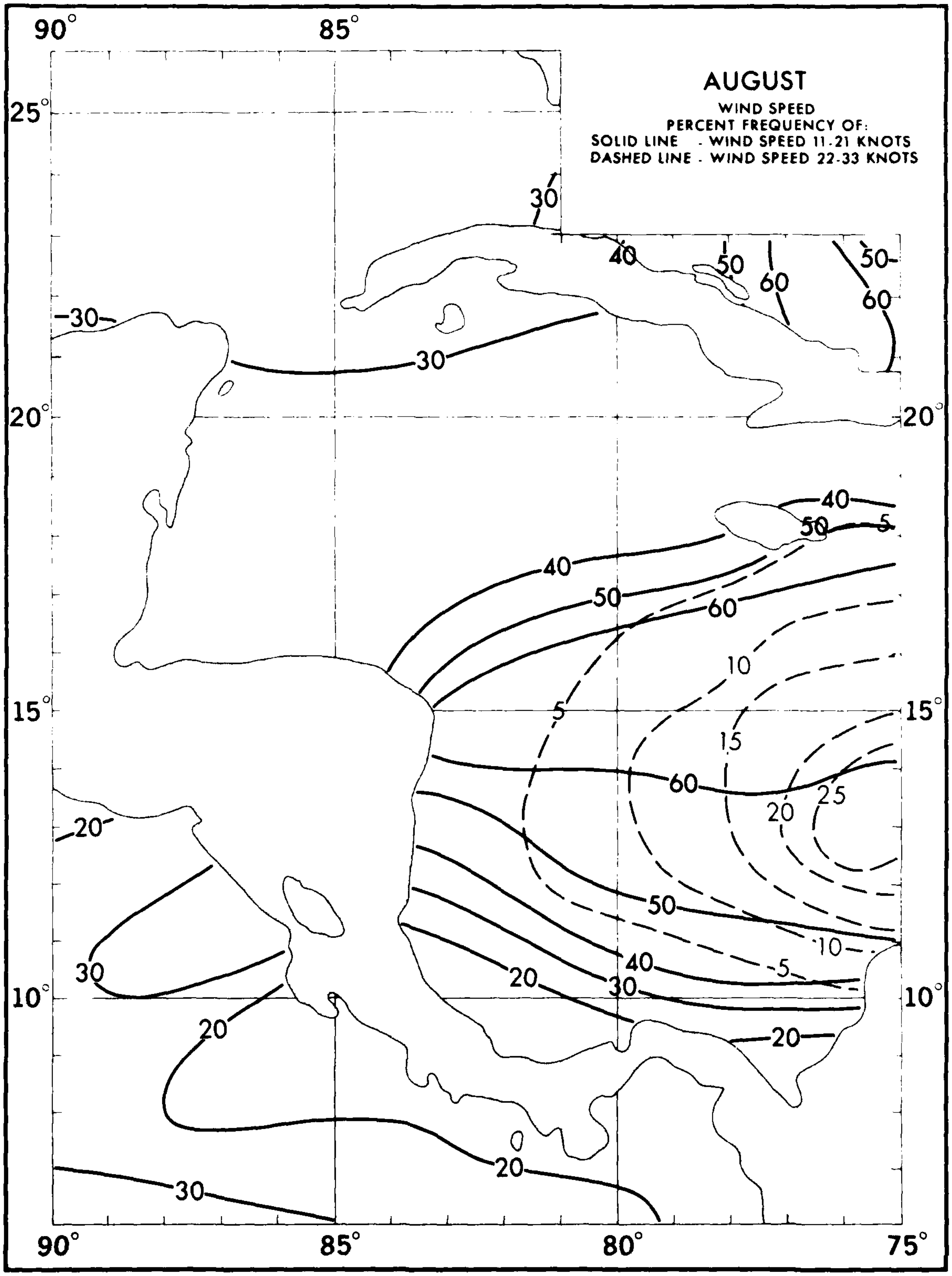


AUGUST
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°

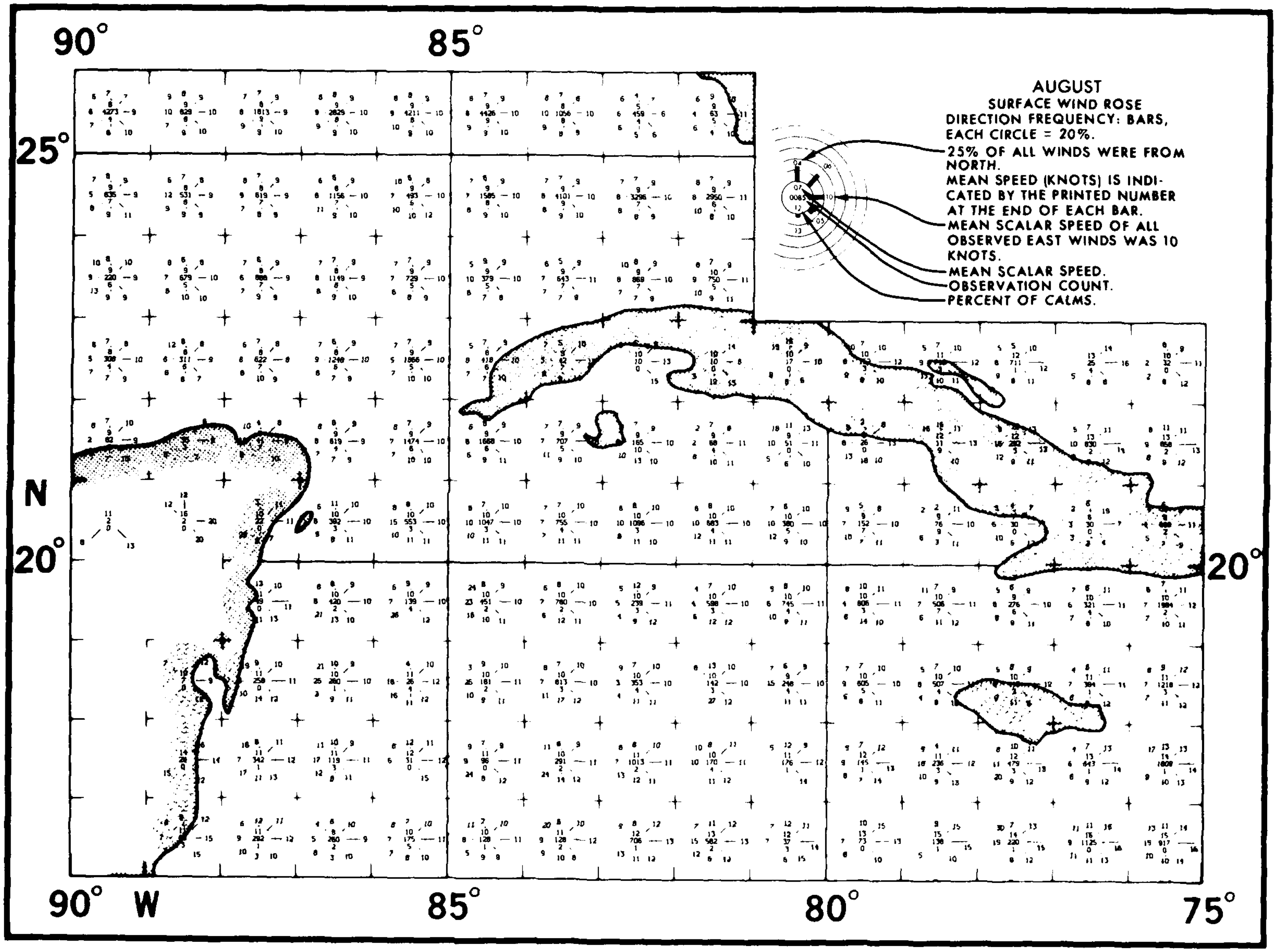


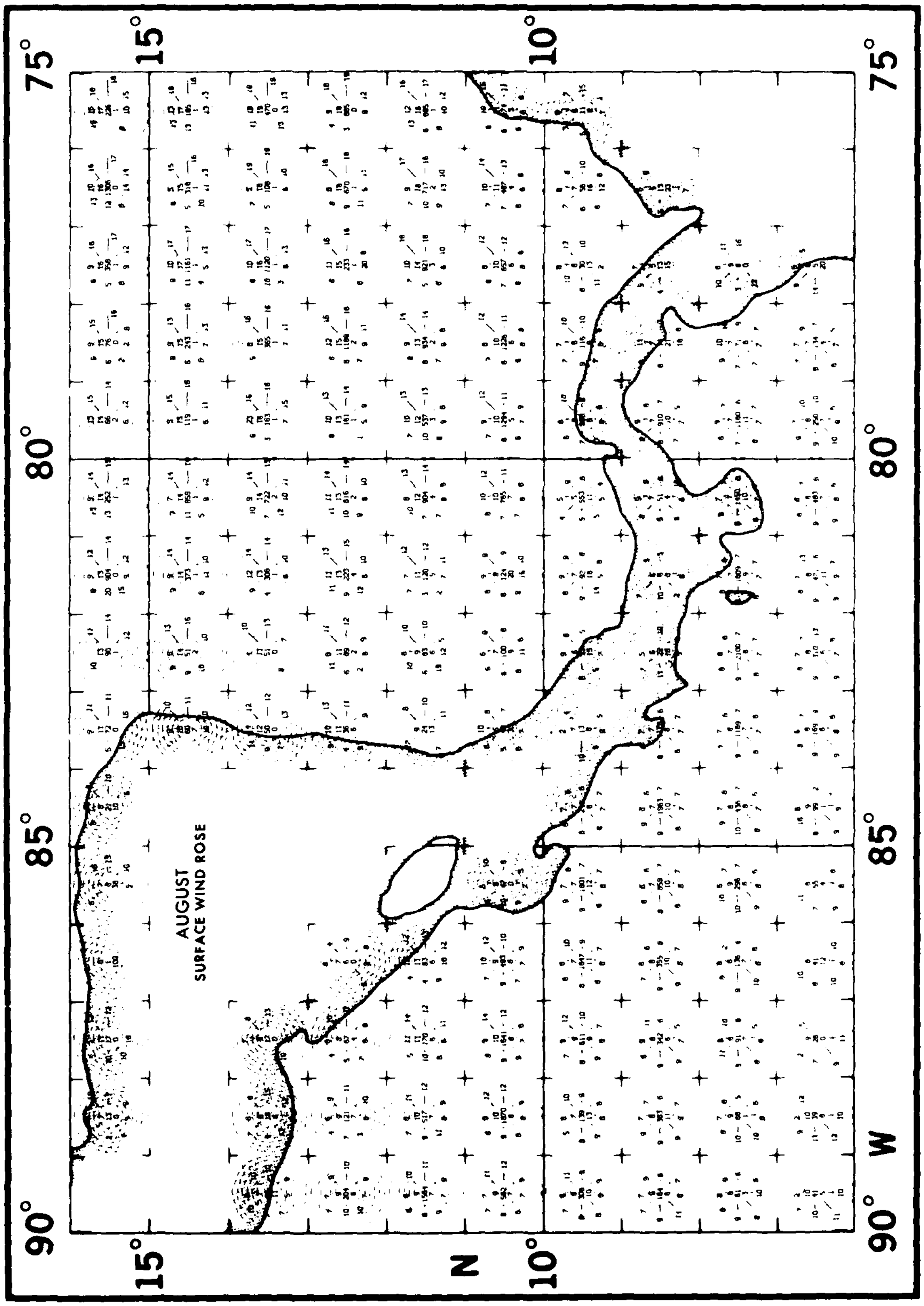
AUGUST
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°

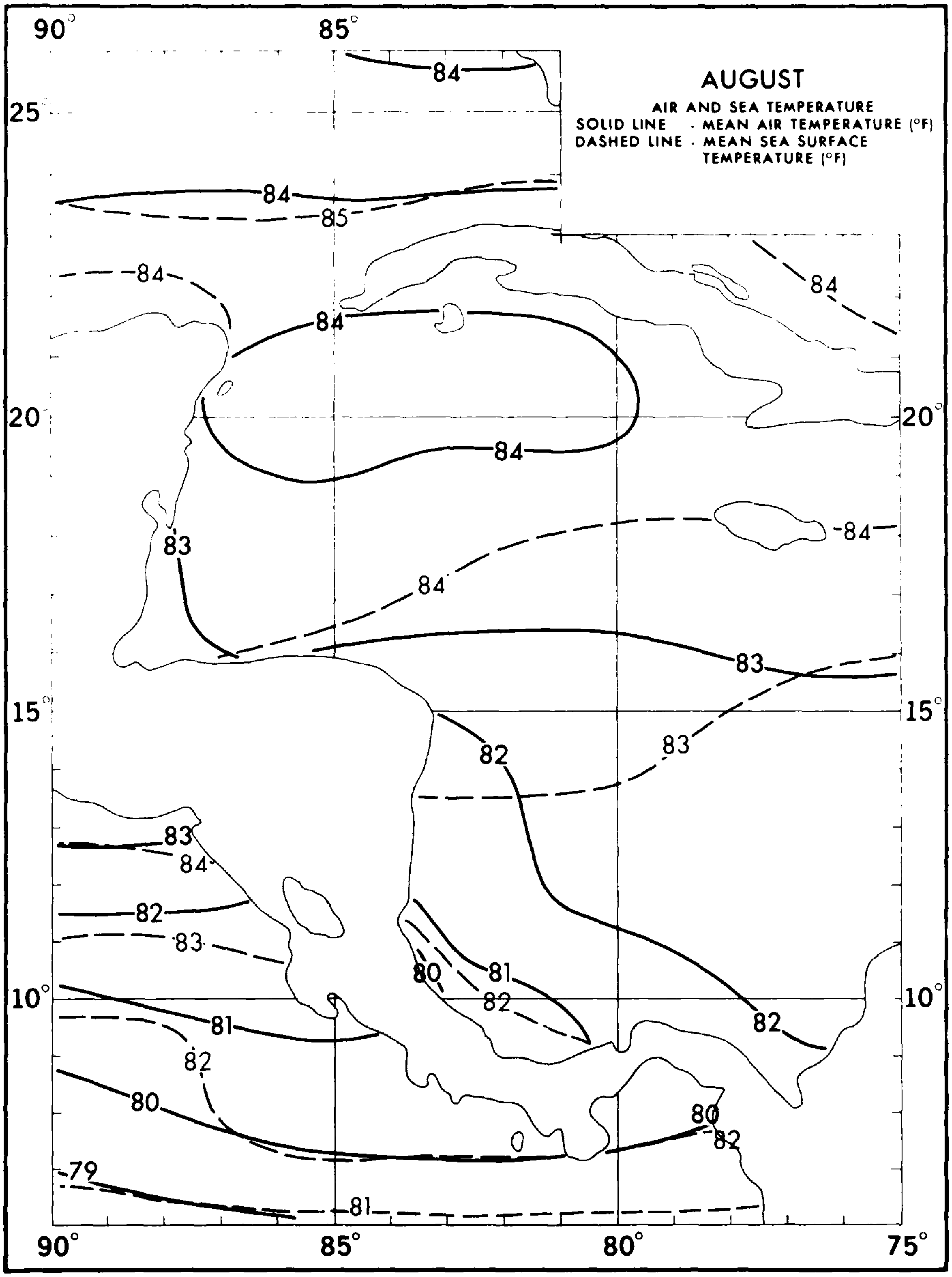

AUGUST
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°
70
60
50
40
30
20
80
1
>1%

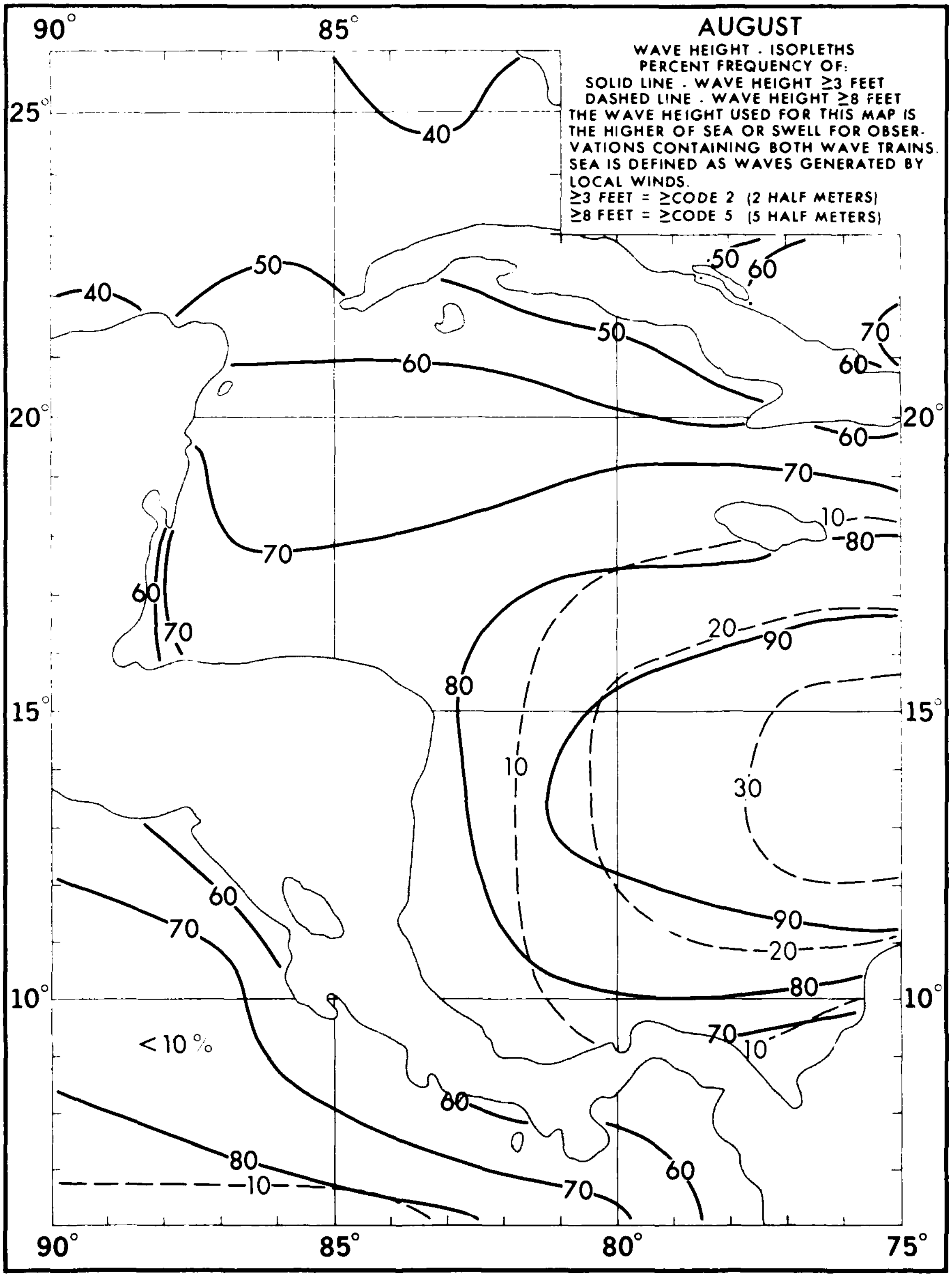


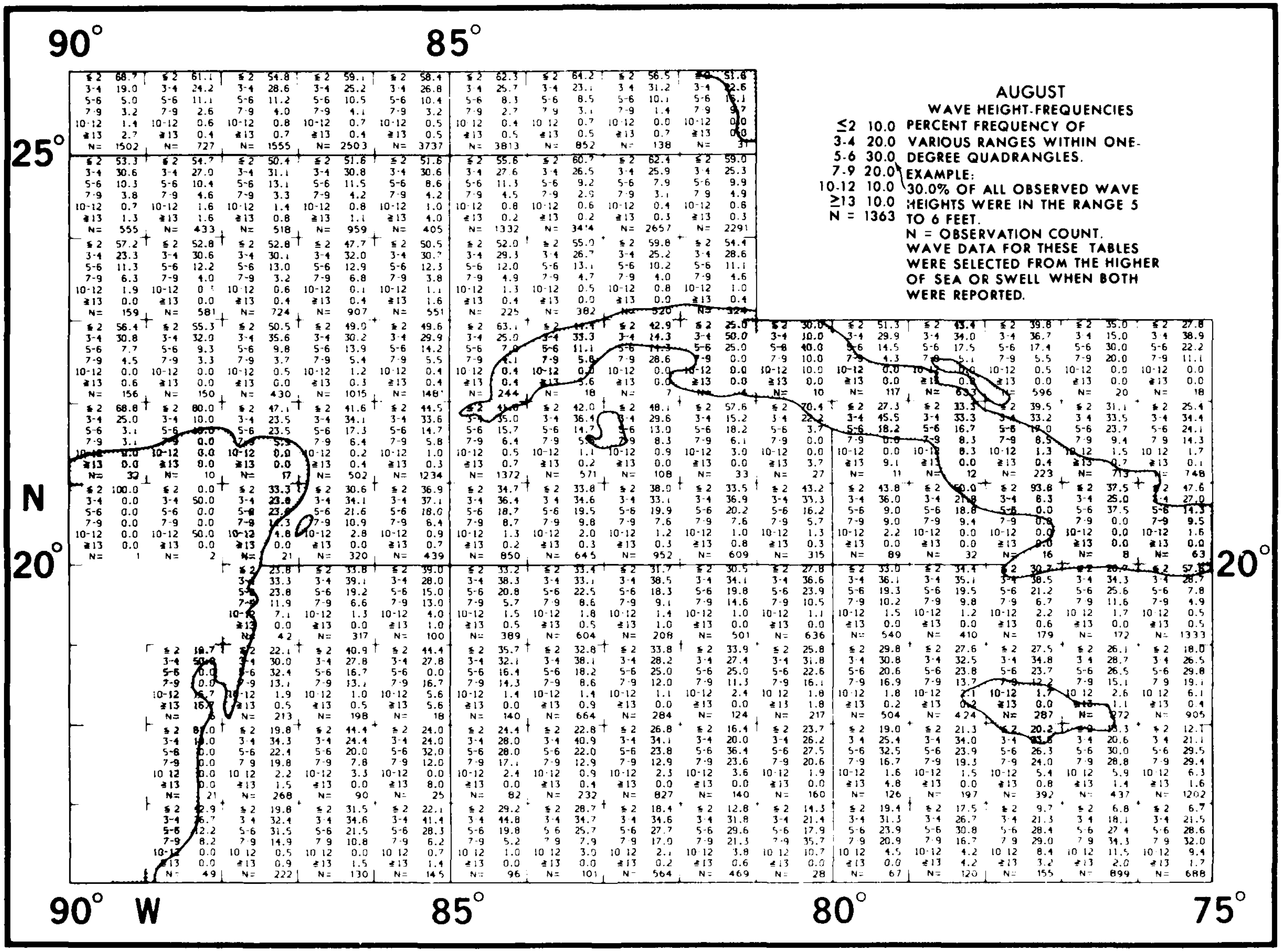
AUGUST
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°

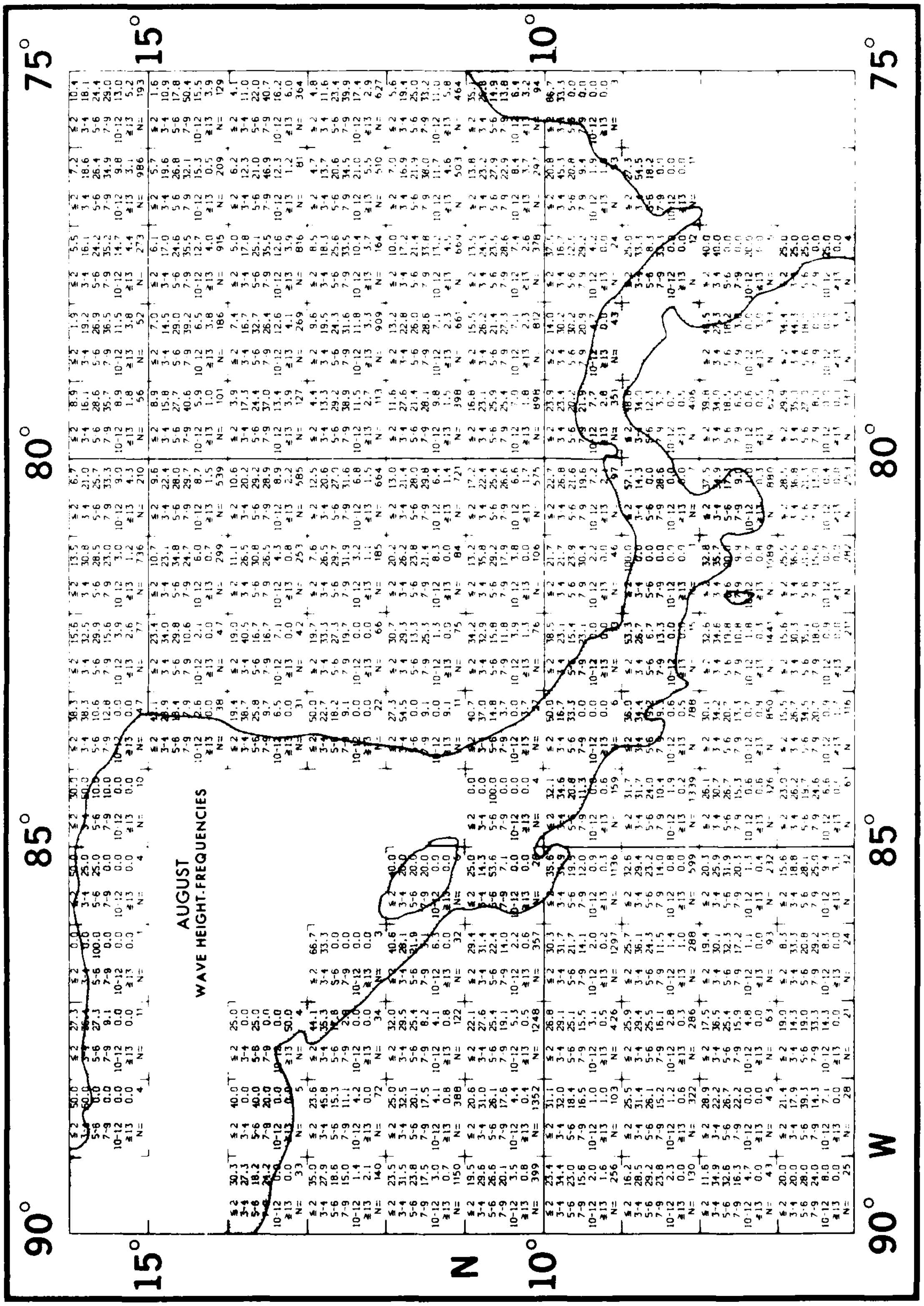

AUGUST
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
80°
75°
25°
20°
N
W

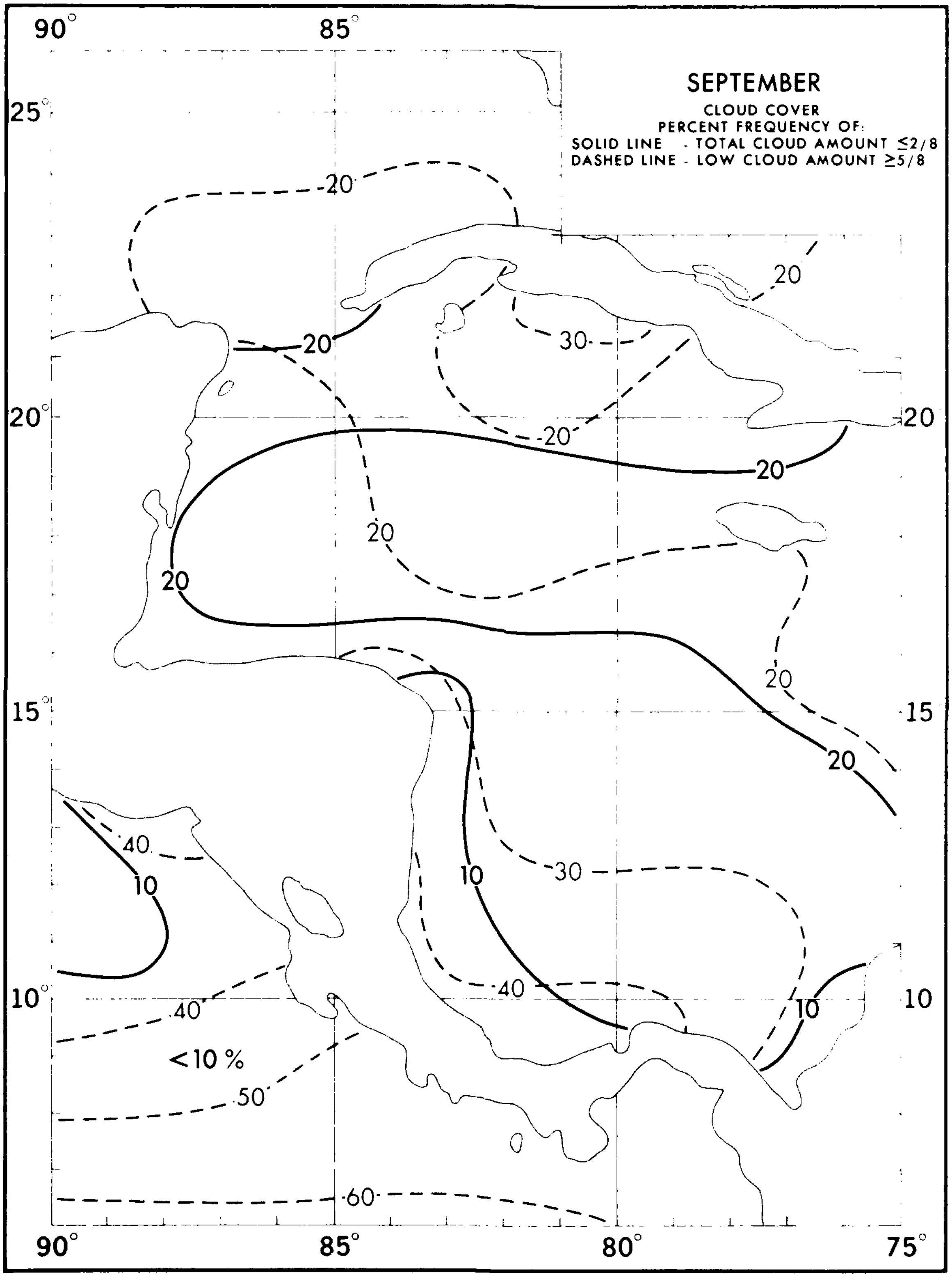

AUGUST
SURFACE WIND ROSE
90°
85°
80°
75°
15°
10°
N
W

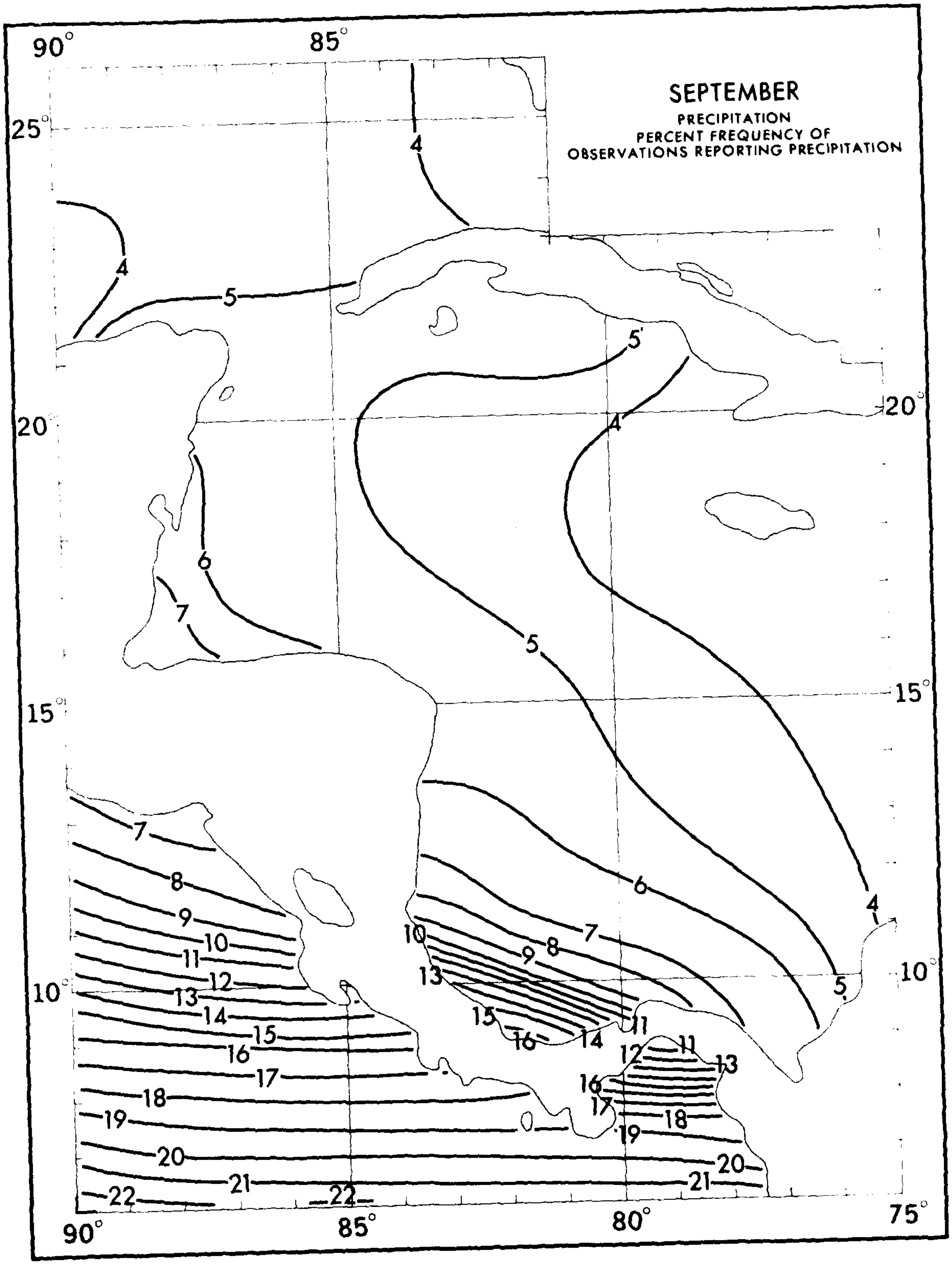

AUGUST
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°
84
85
83
82
81
80
79

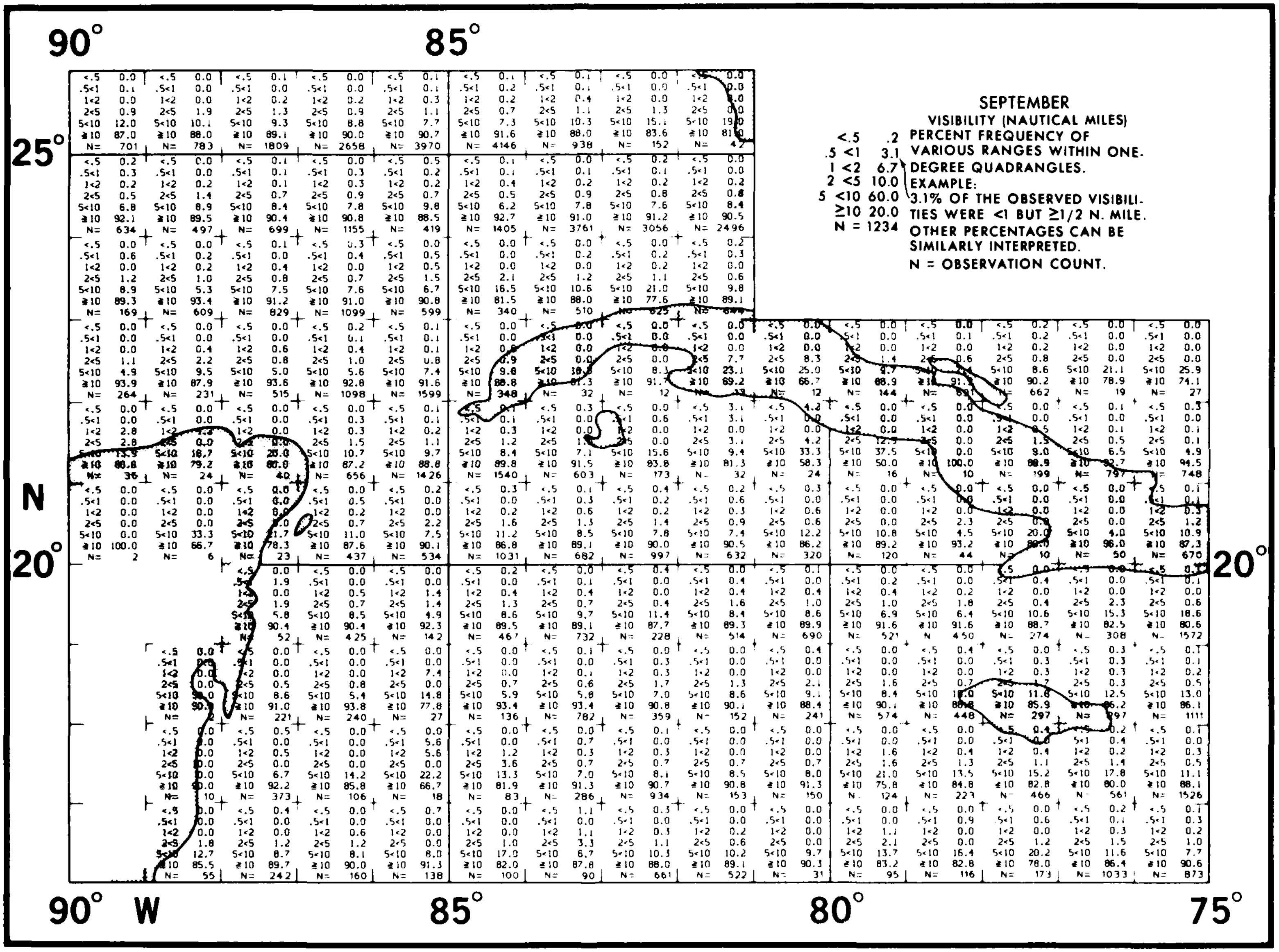

AUGUST
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°
< 10 %

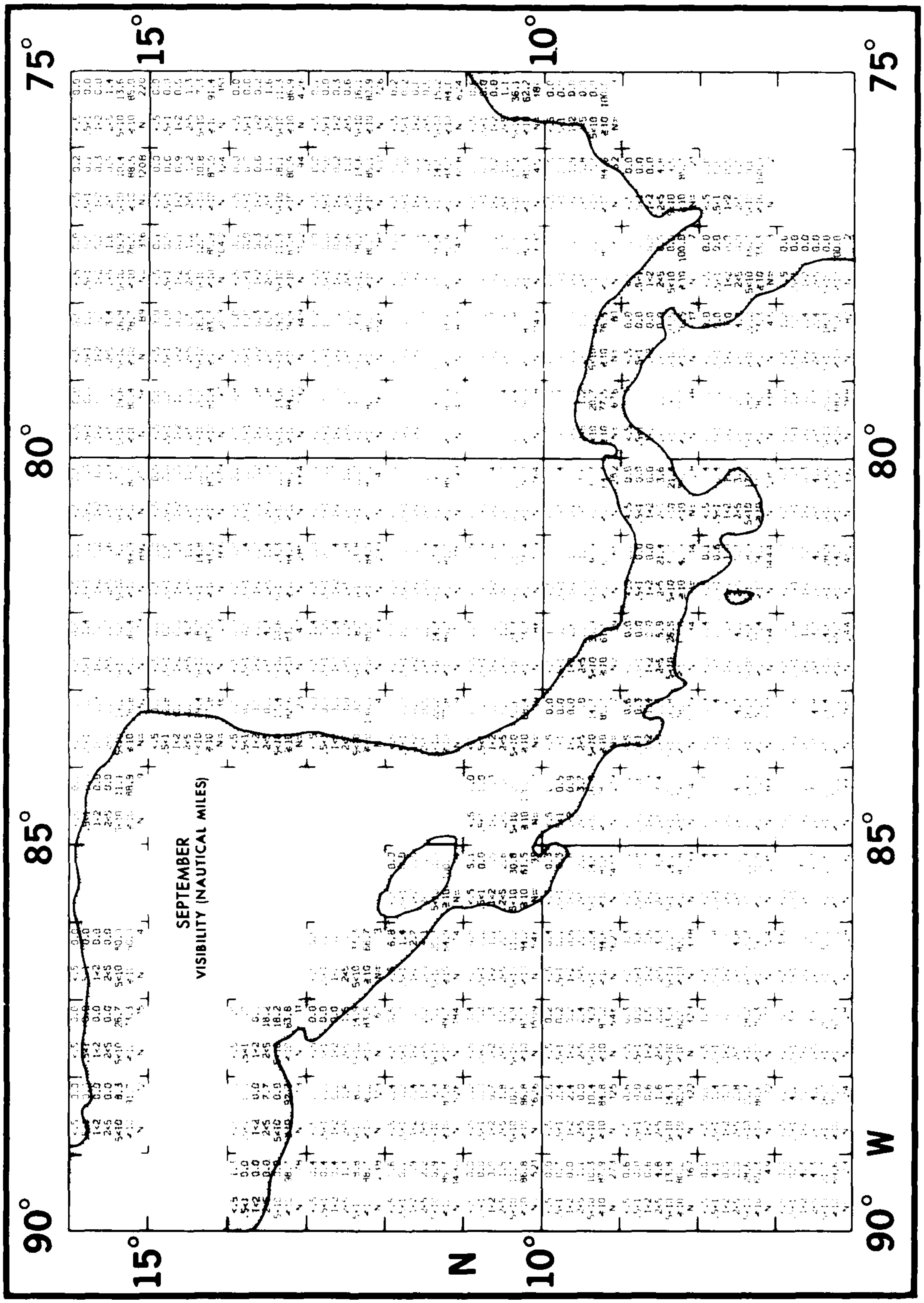

AUGUST
WAVE HEIGHT-FREQUENCIES
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
90°
85°
80°
75°
90° W
25°
N
20°
20°

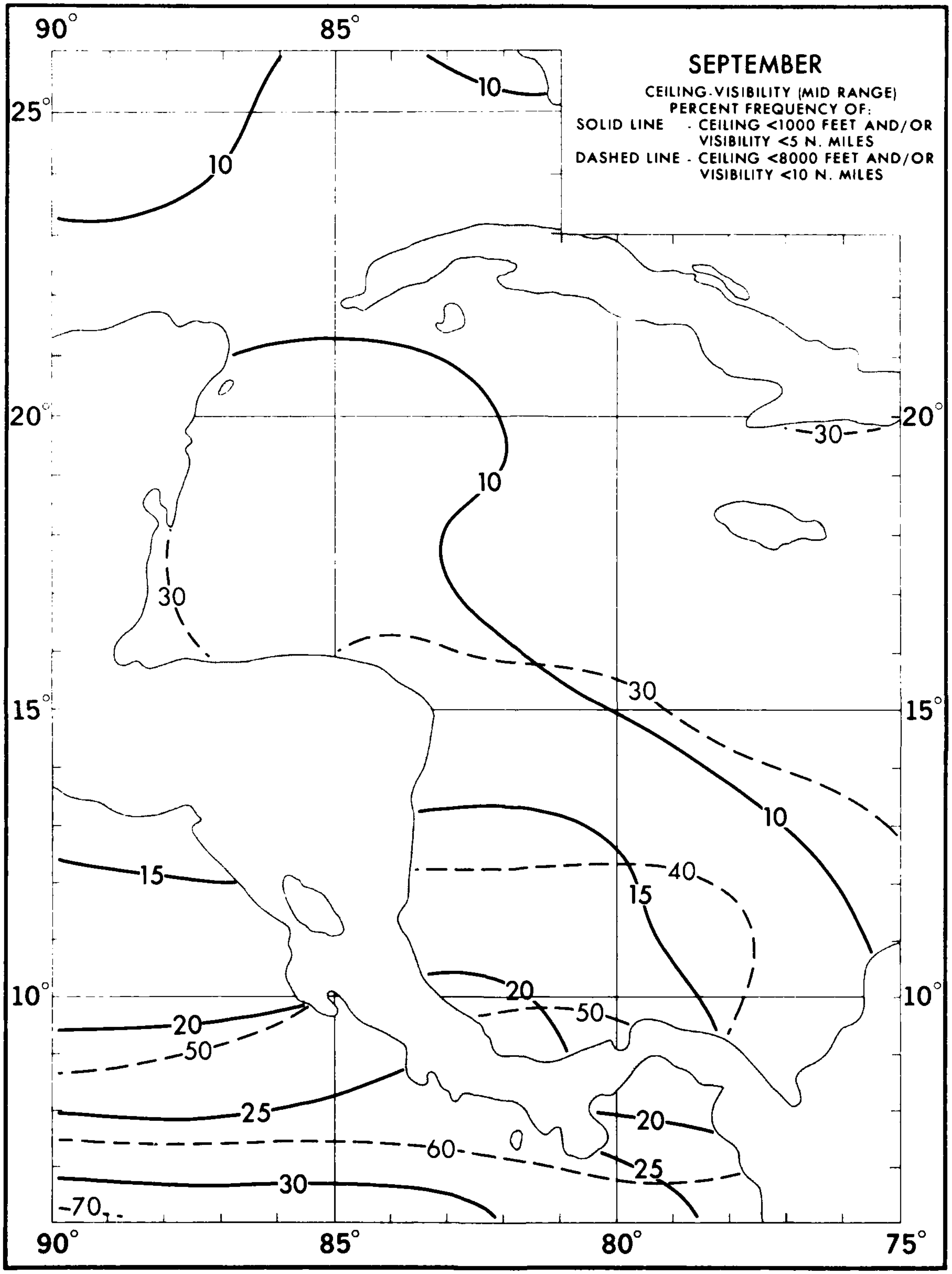

AUGUST
WAVE HEIGHT FREQUENCIES
90°
85°
80°
75°
W
15°
10°
N


SEPTEMBER
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°
20
30
40
10
50
60
<10 %

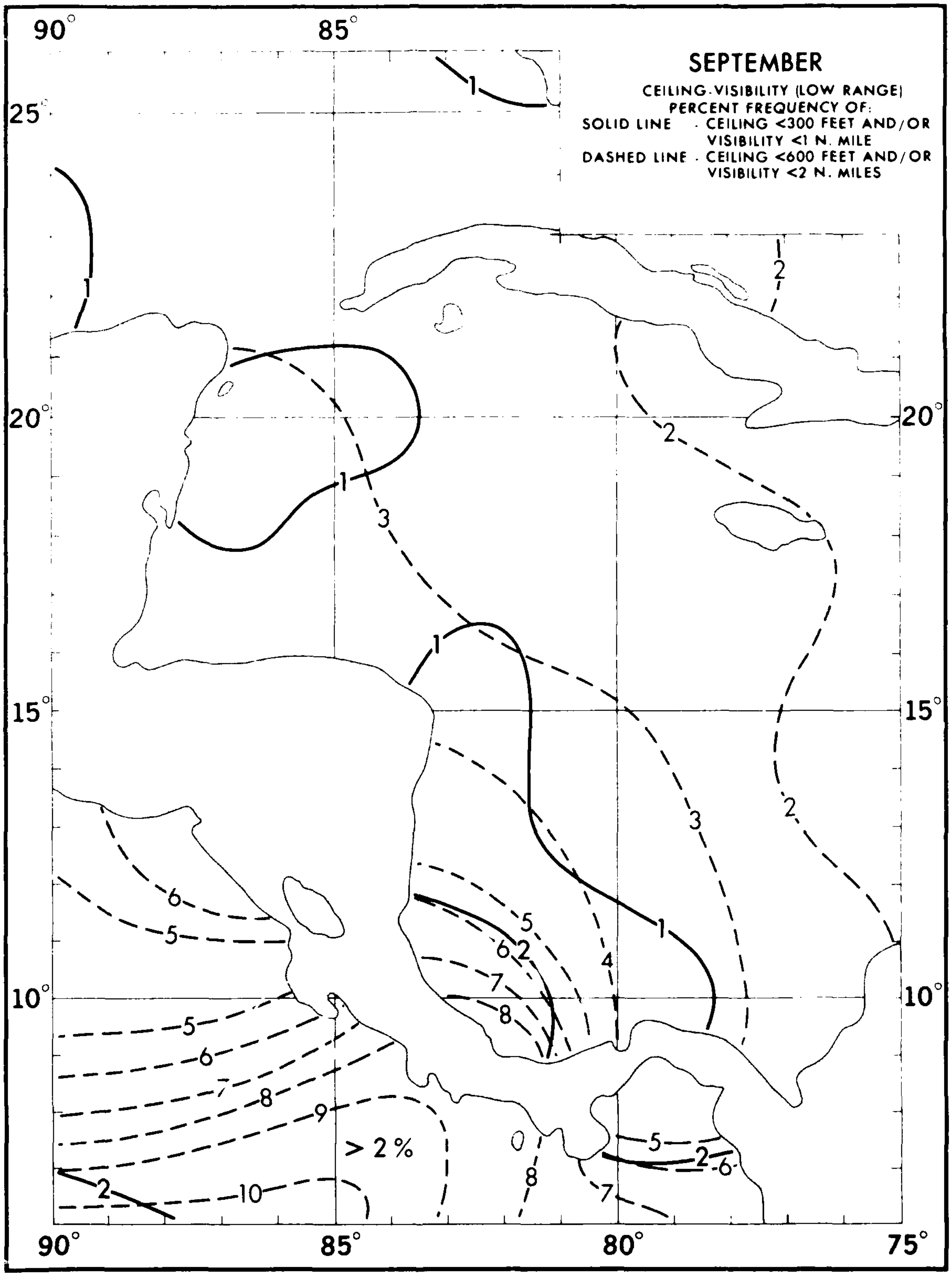

SEPTEMBER
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°

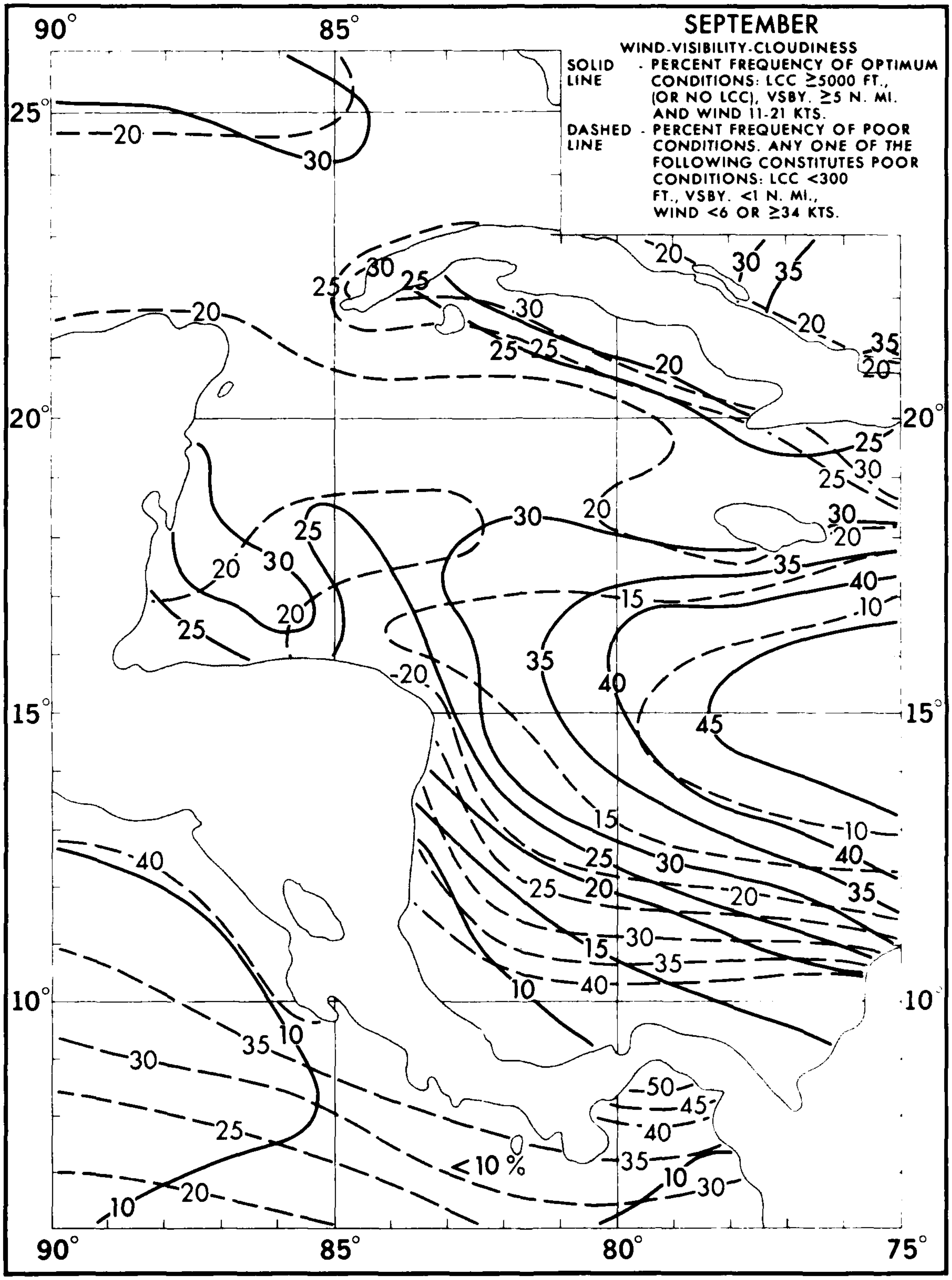

SEPTEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE. OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
80°
75°
W
25°
N
20°

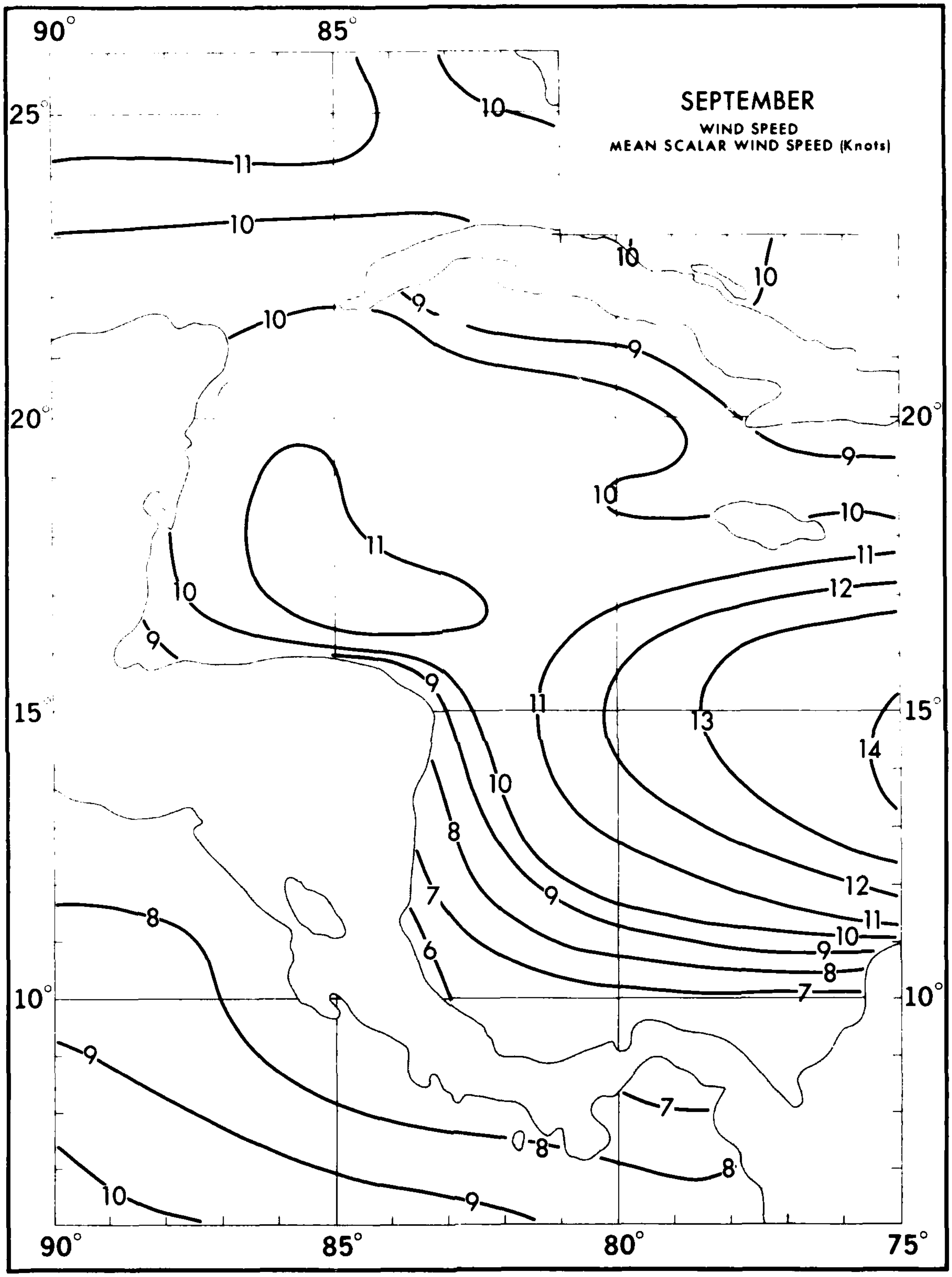

SEPTEMBER
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
10°
N
W

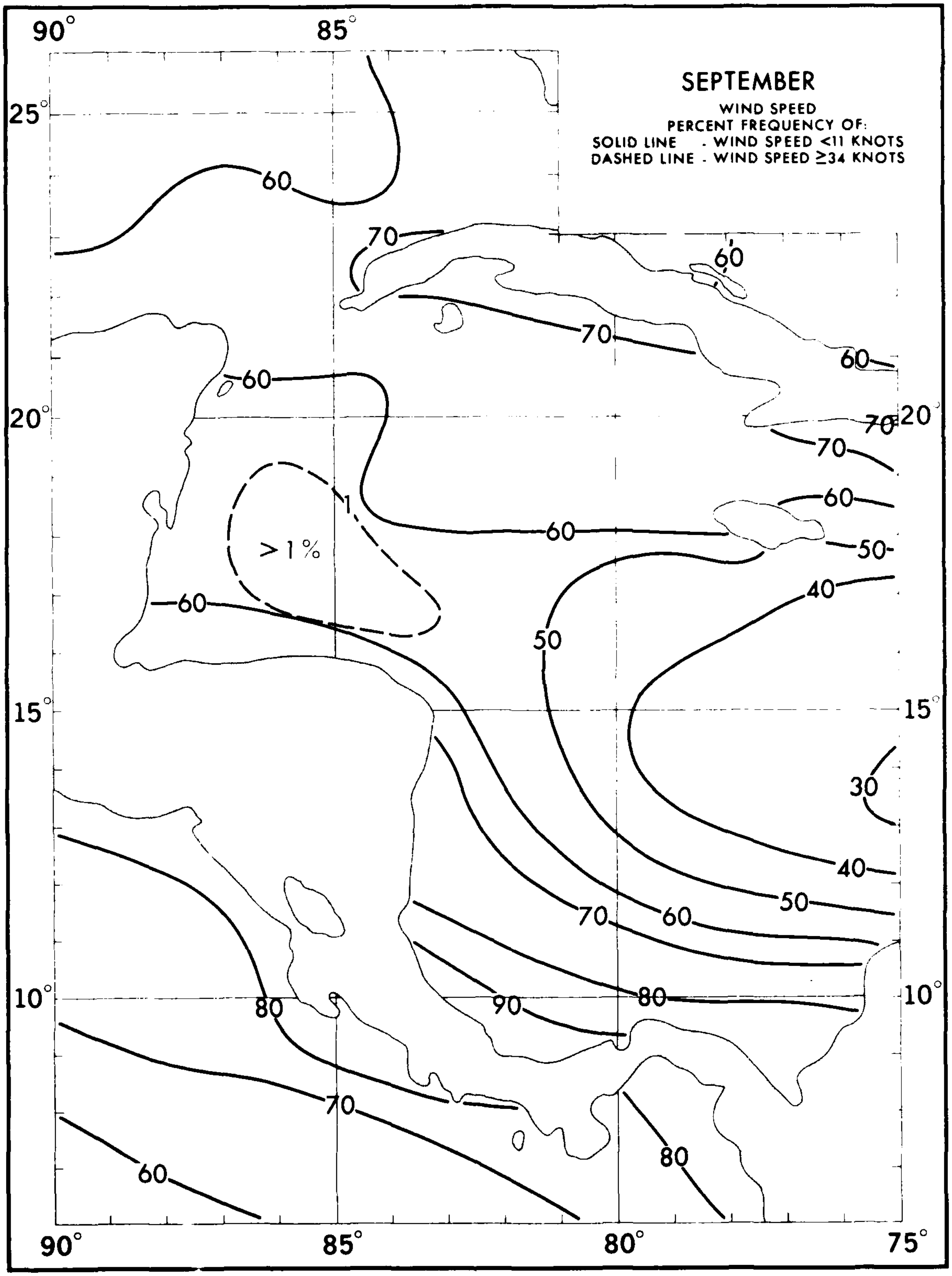


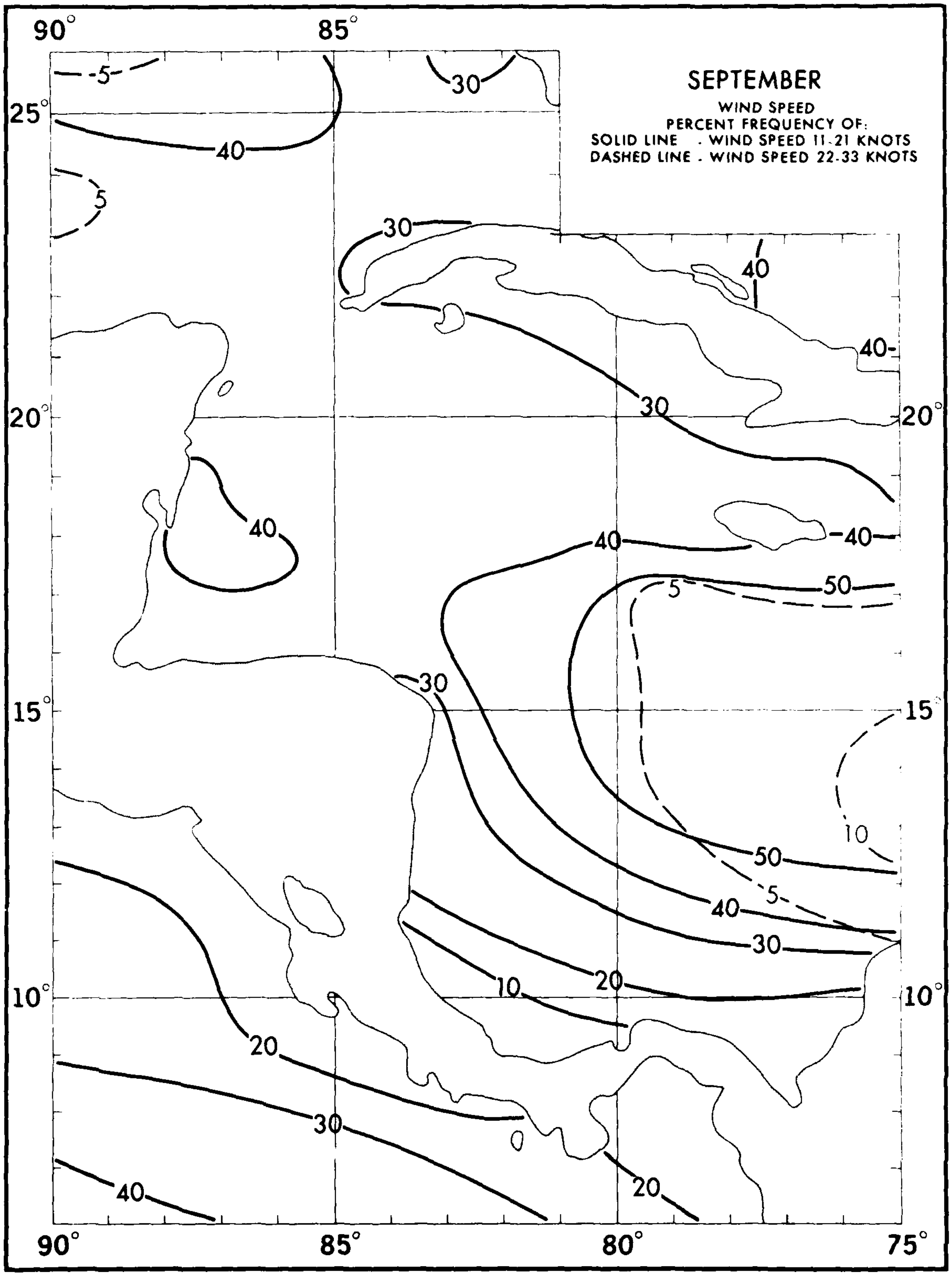
SEPTEMBER
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
10
10
10
10
30
30
30
15
15
40
20
20
20
50
50
25
25
60
30
70


SEPTEMBER
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
> 2 %

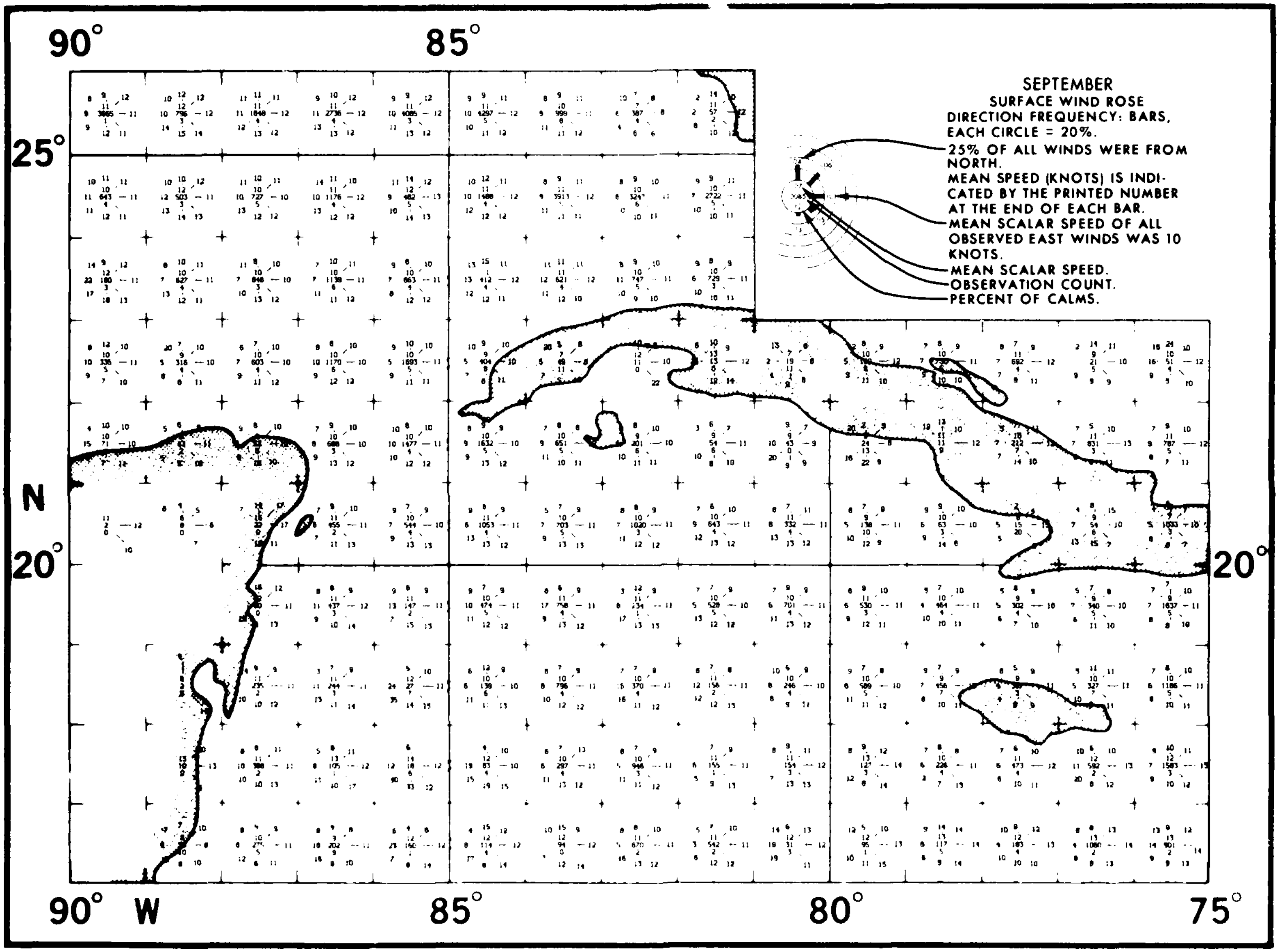

SEPTEMBER
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°
<10 %


SEPTEMBER
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°
11
10
9
12
13
14
8
7
6

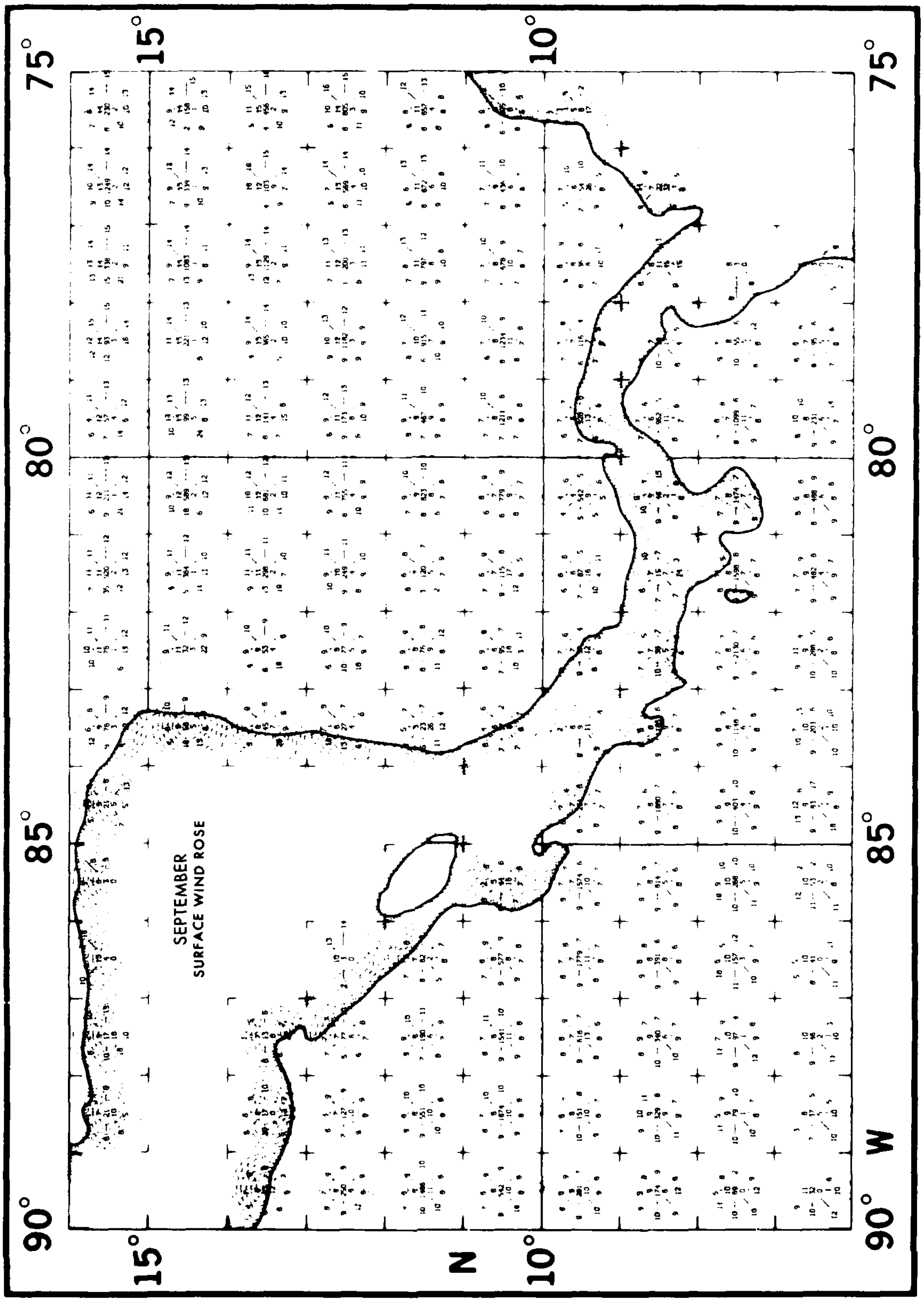

SEPTEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
>1%
90°
85°
80°
75°
25°
20°
15°
10°

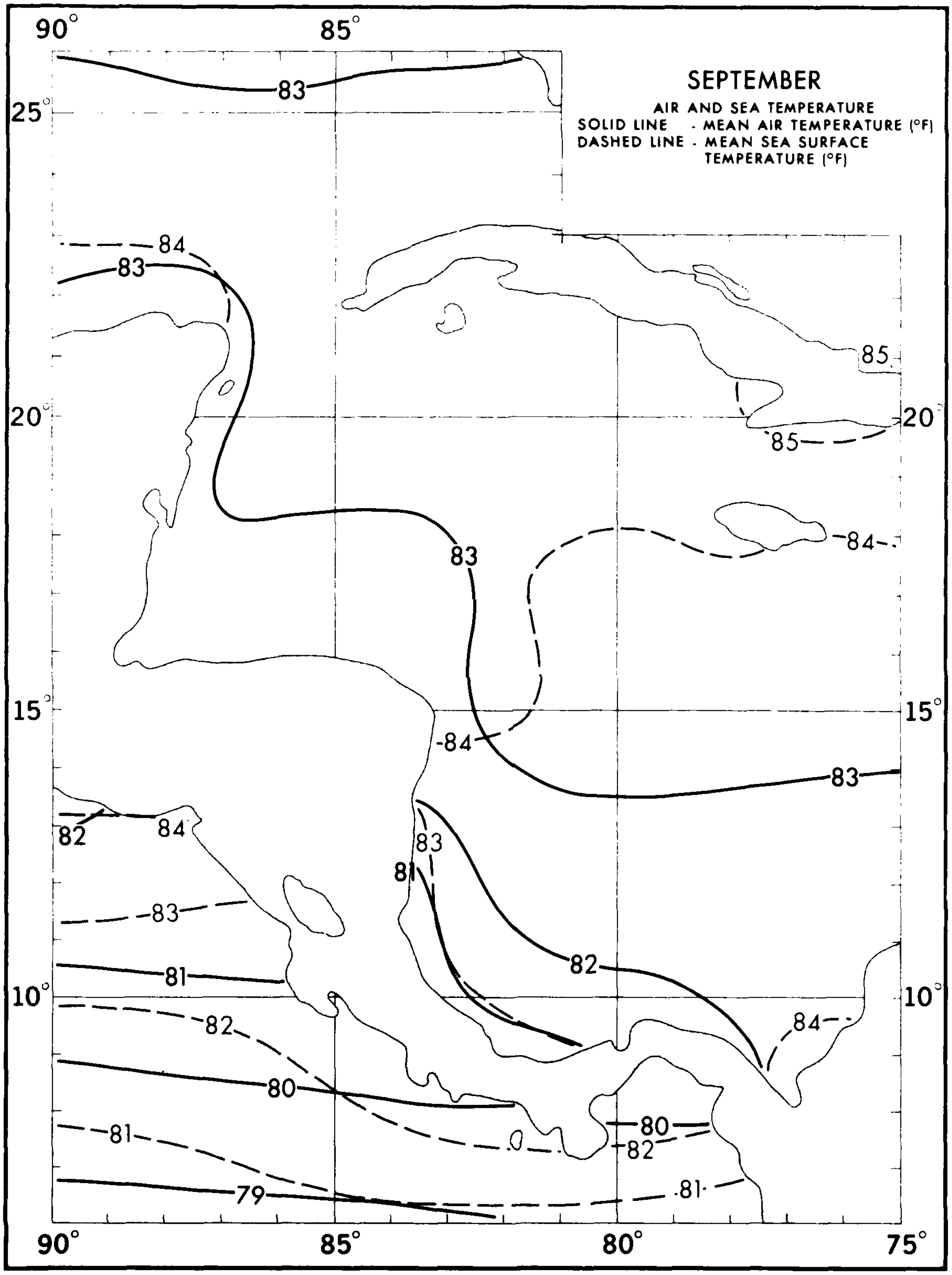


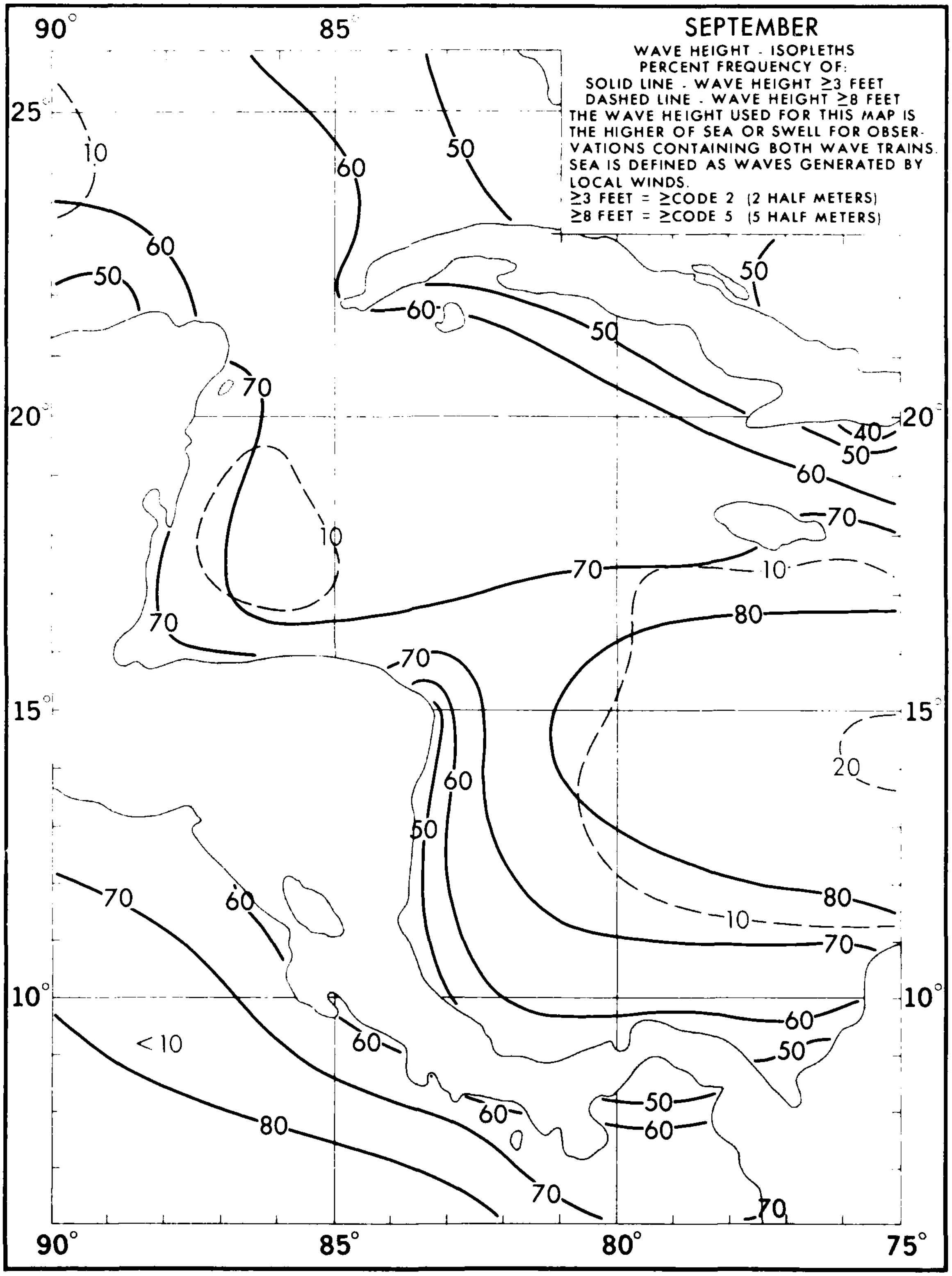
SEPTEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°
5
30
40
50
20
10

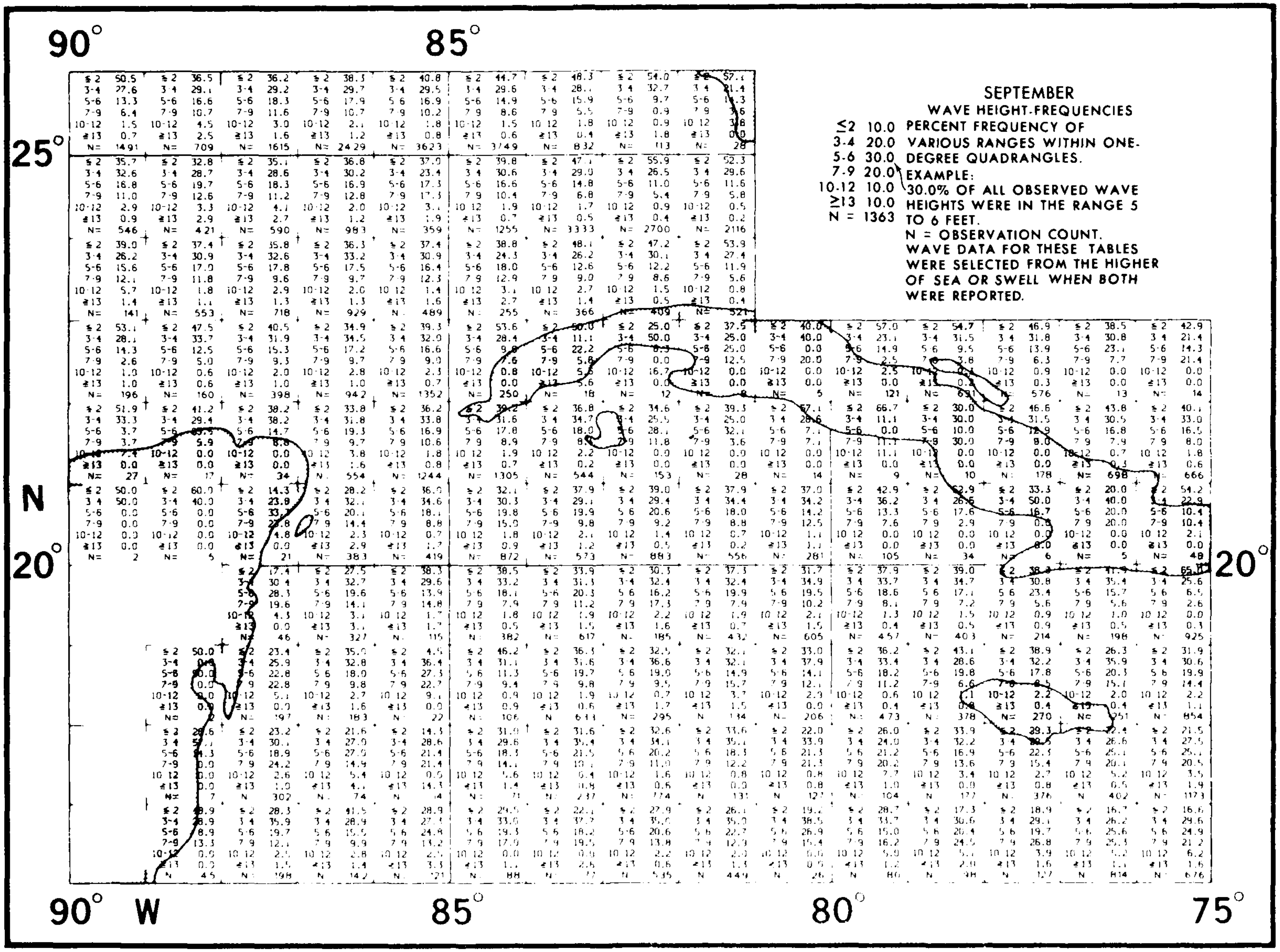


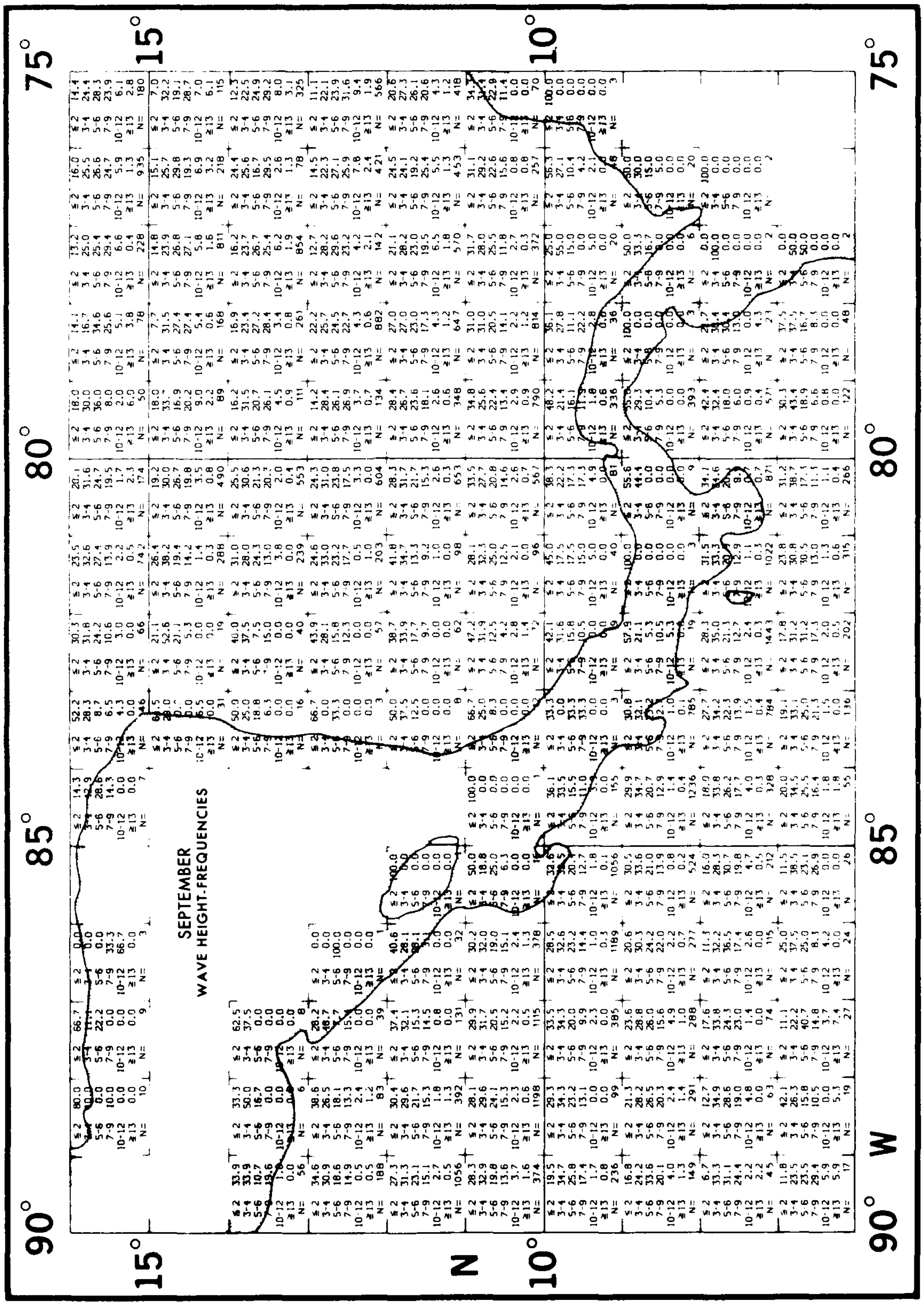
SEPTEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
80°
75°
25°
20°
N
W

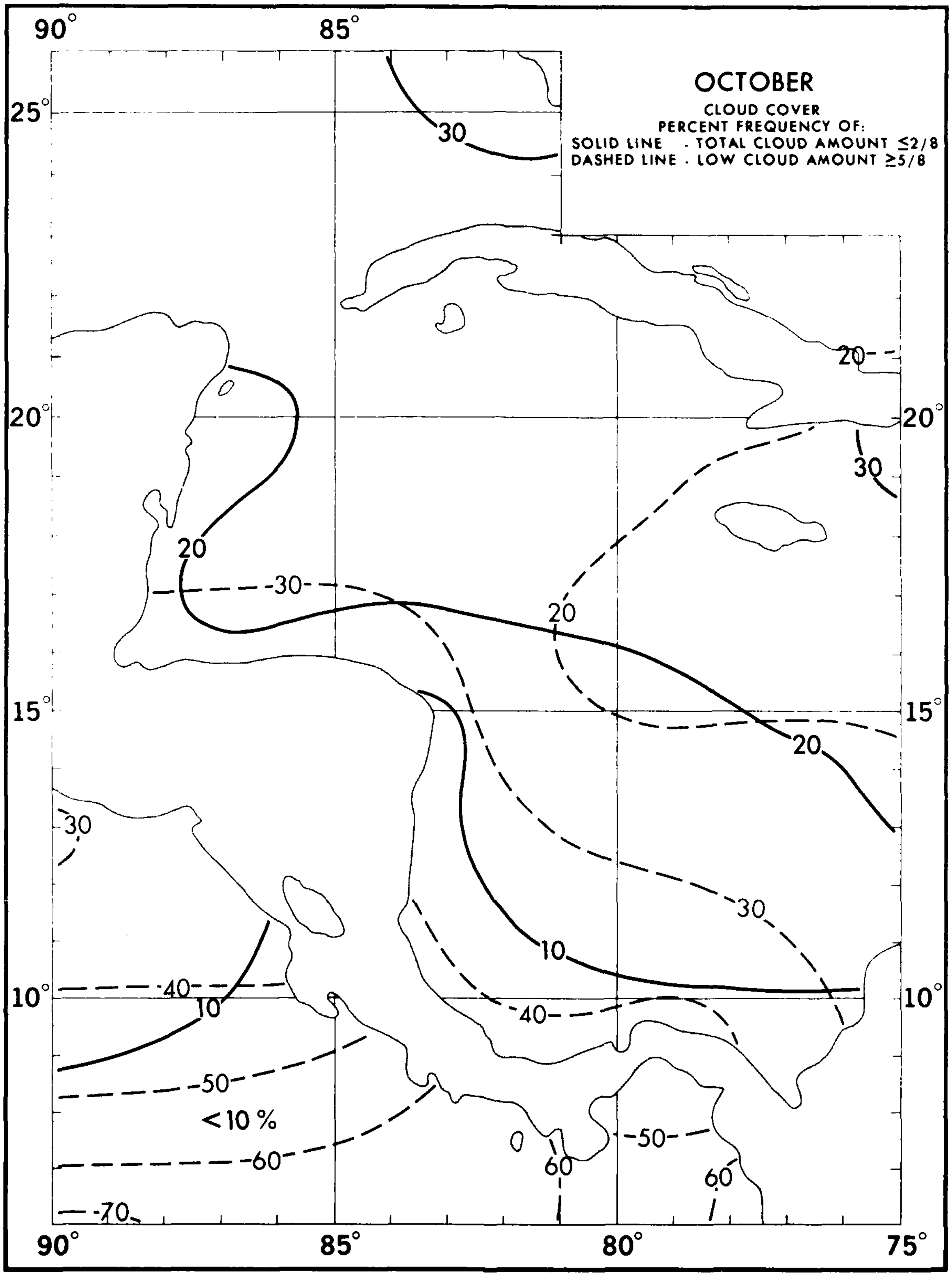

SEPTEMBER
SURFACE WIND ROSE
90°
85°
80°
75°
15°
10°
N
W

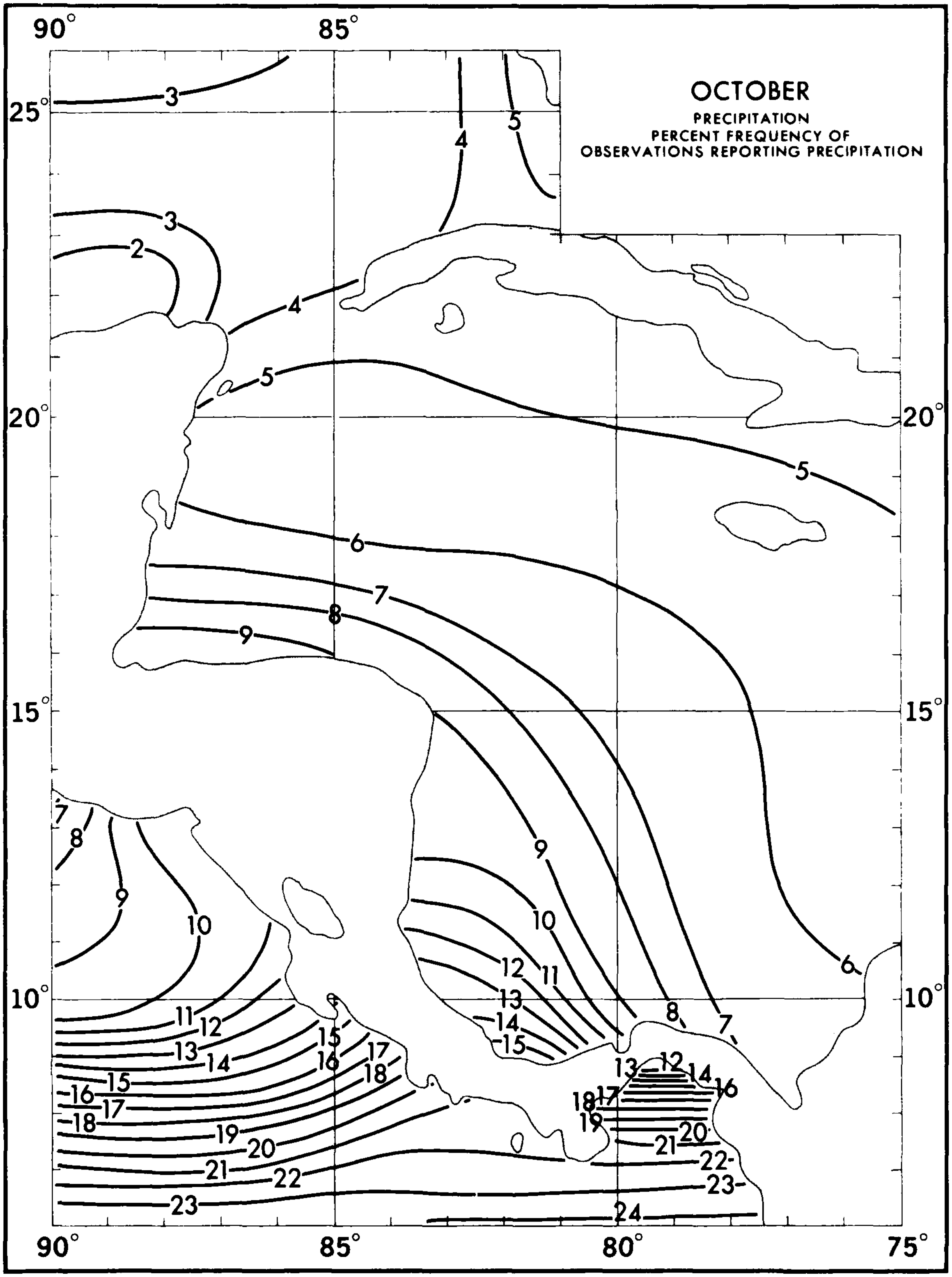

SEPTEMBER
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°
83
84
85
82
81
80
79


SEPTEMBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90° 85° 80° 75°
25° 20° 15° 10°
<10

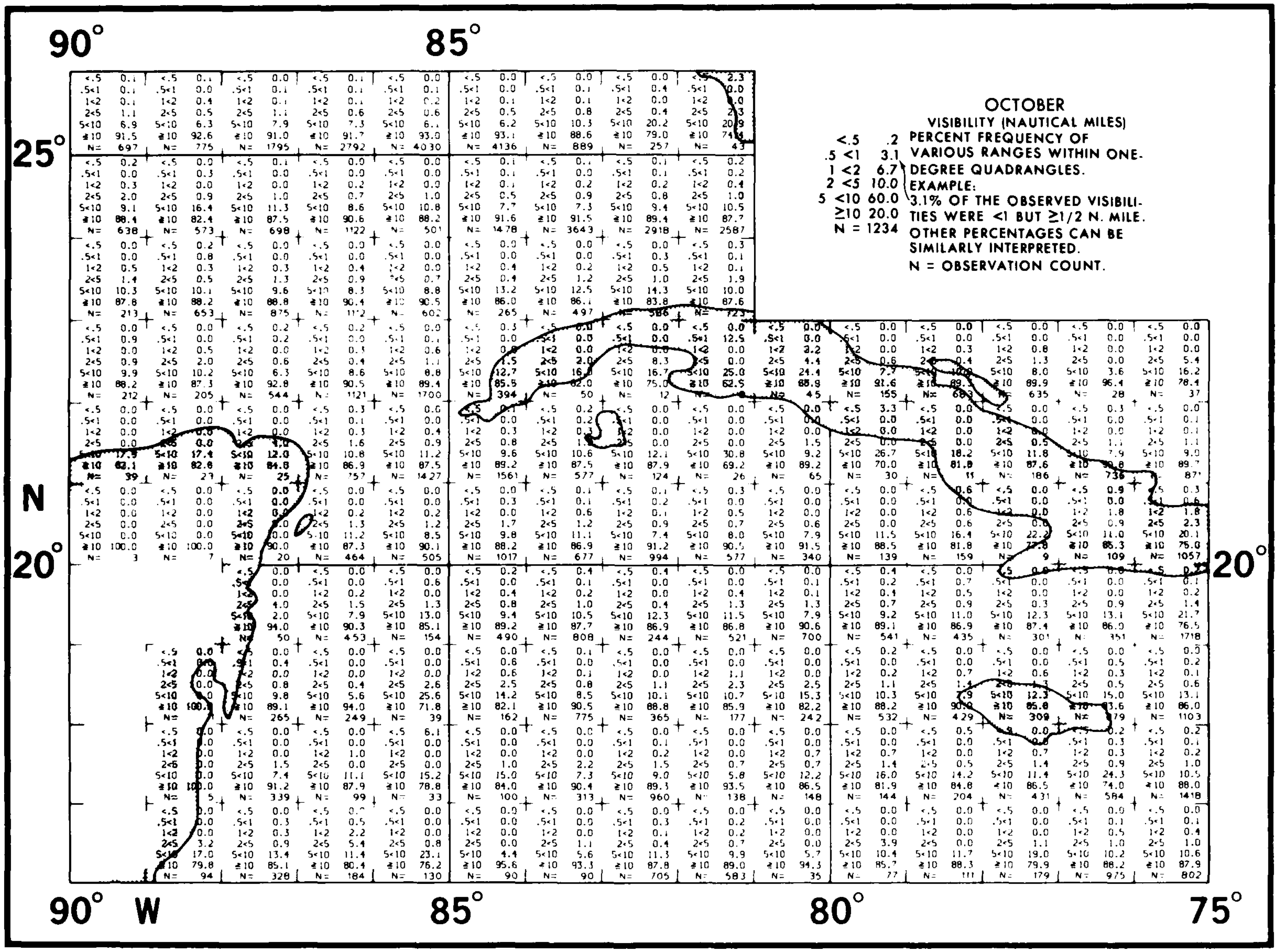

SEPTEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
90°
85°
80°
75°
25°
20°
N
W

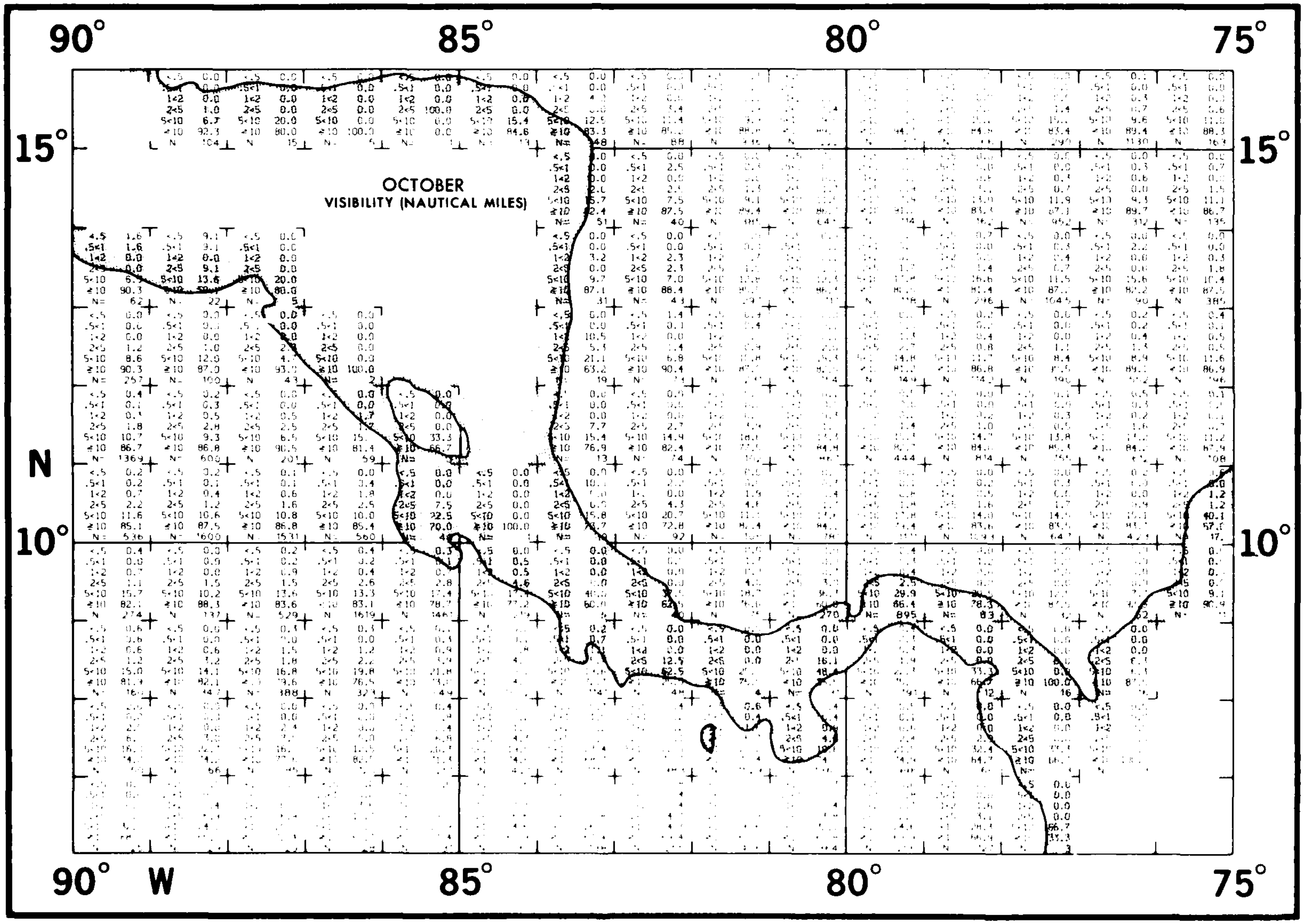

SEPTEMBER
WAVE HEIGHT-FREQUENCIES
90°
85°
80°
75°
15°
10°
N
W

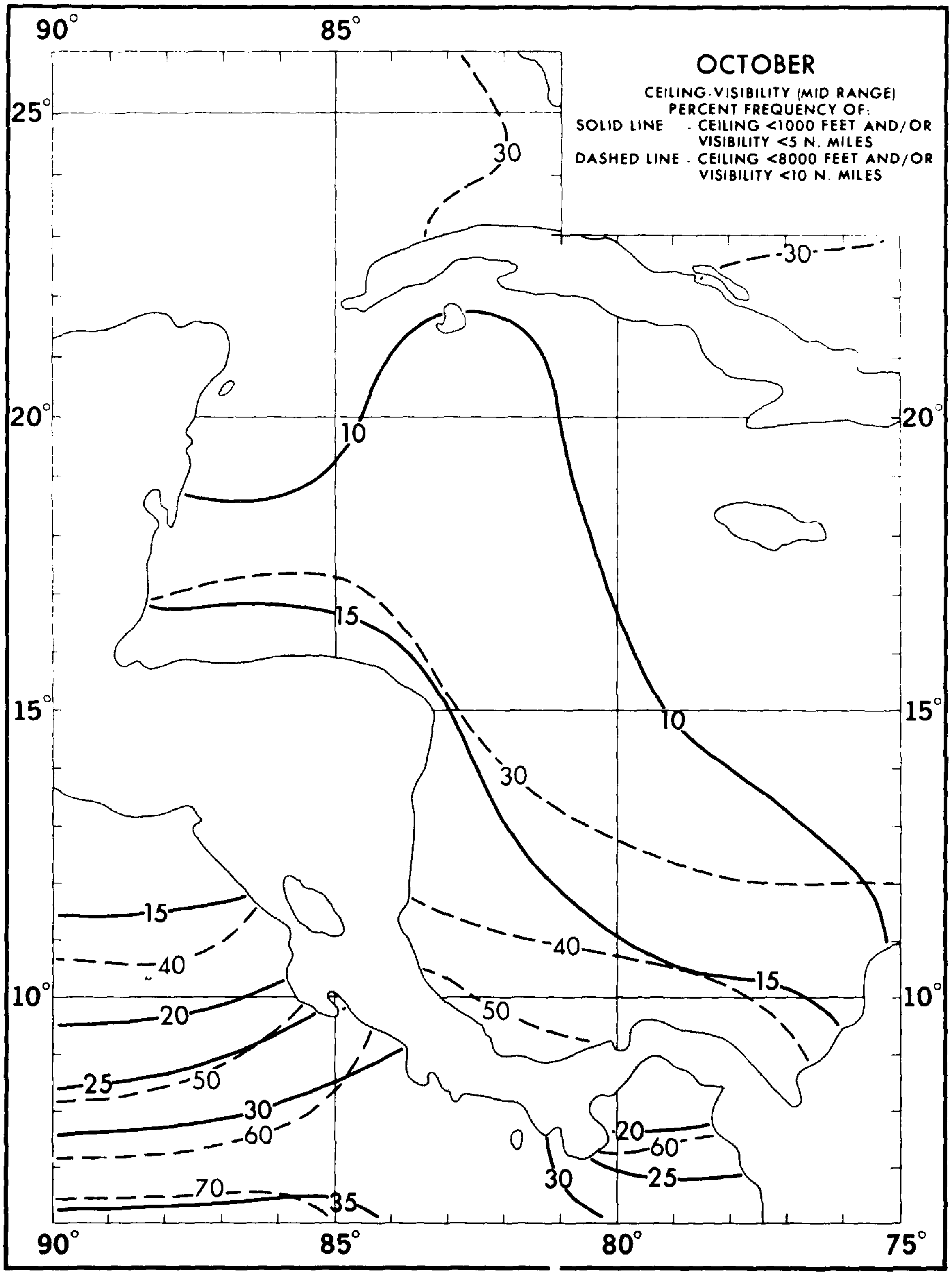

OCTOBER
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°
30
20
30
20
30
20
20
30
30
10
40
10
40
50
<10 %
60
50
60
60
70

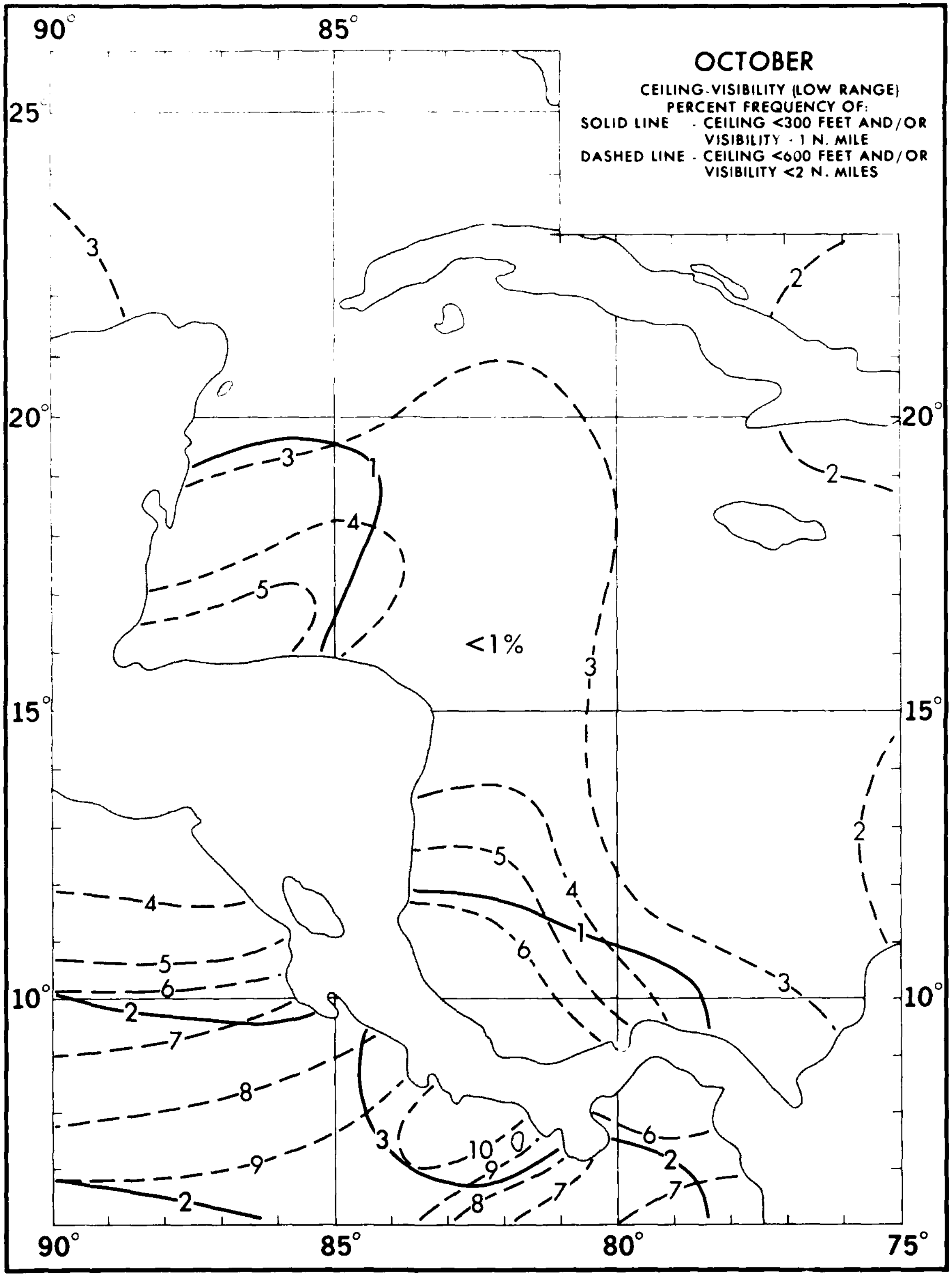


OCTOBER
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°

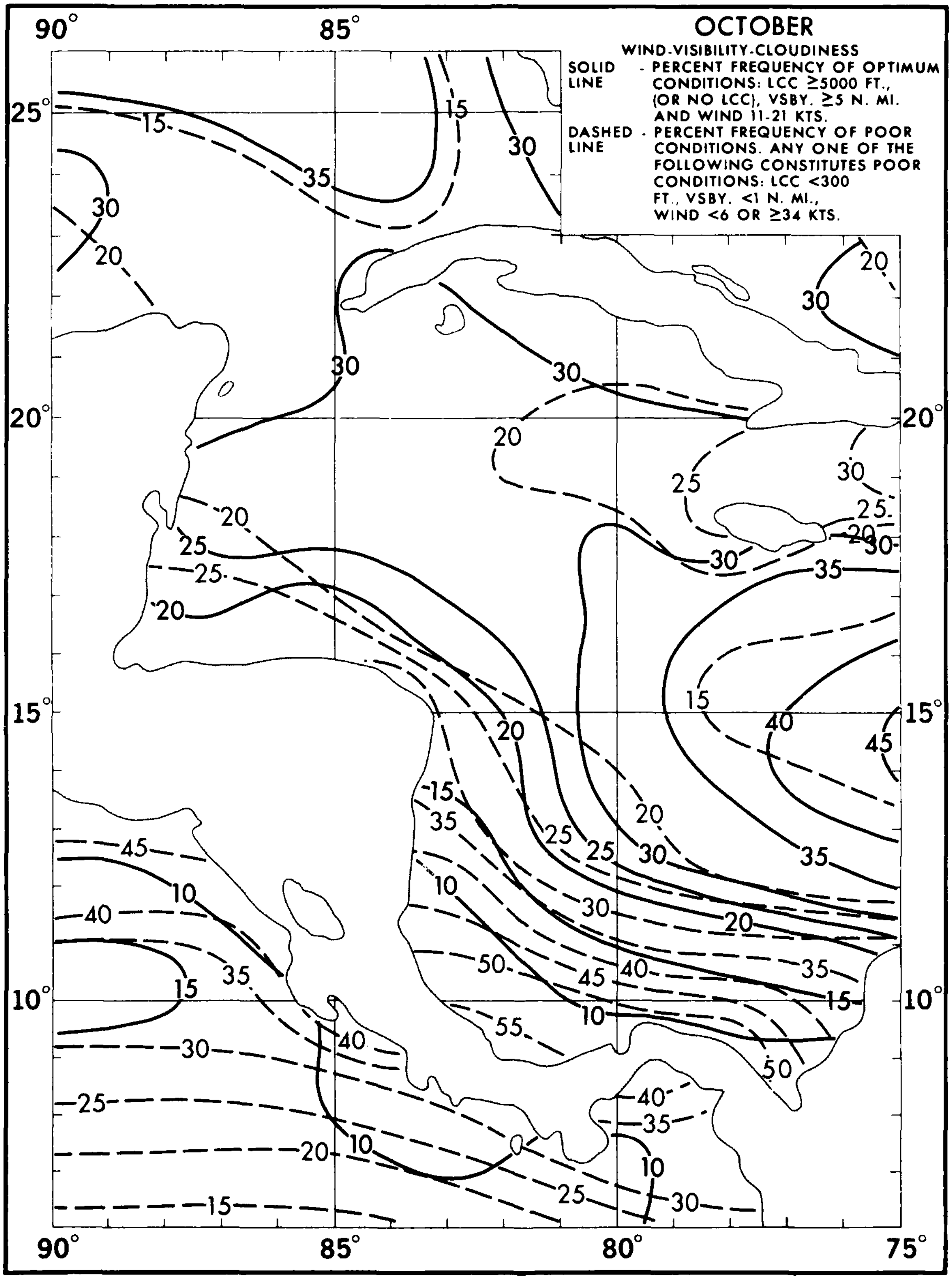

OCTOBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE. OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
80°
75°
25°
20°
N
W


OCTOBER
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
10°
N
W

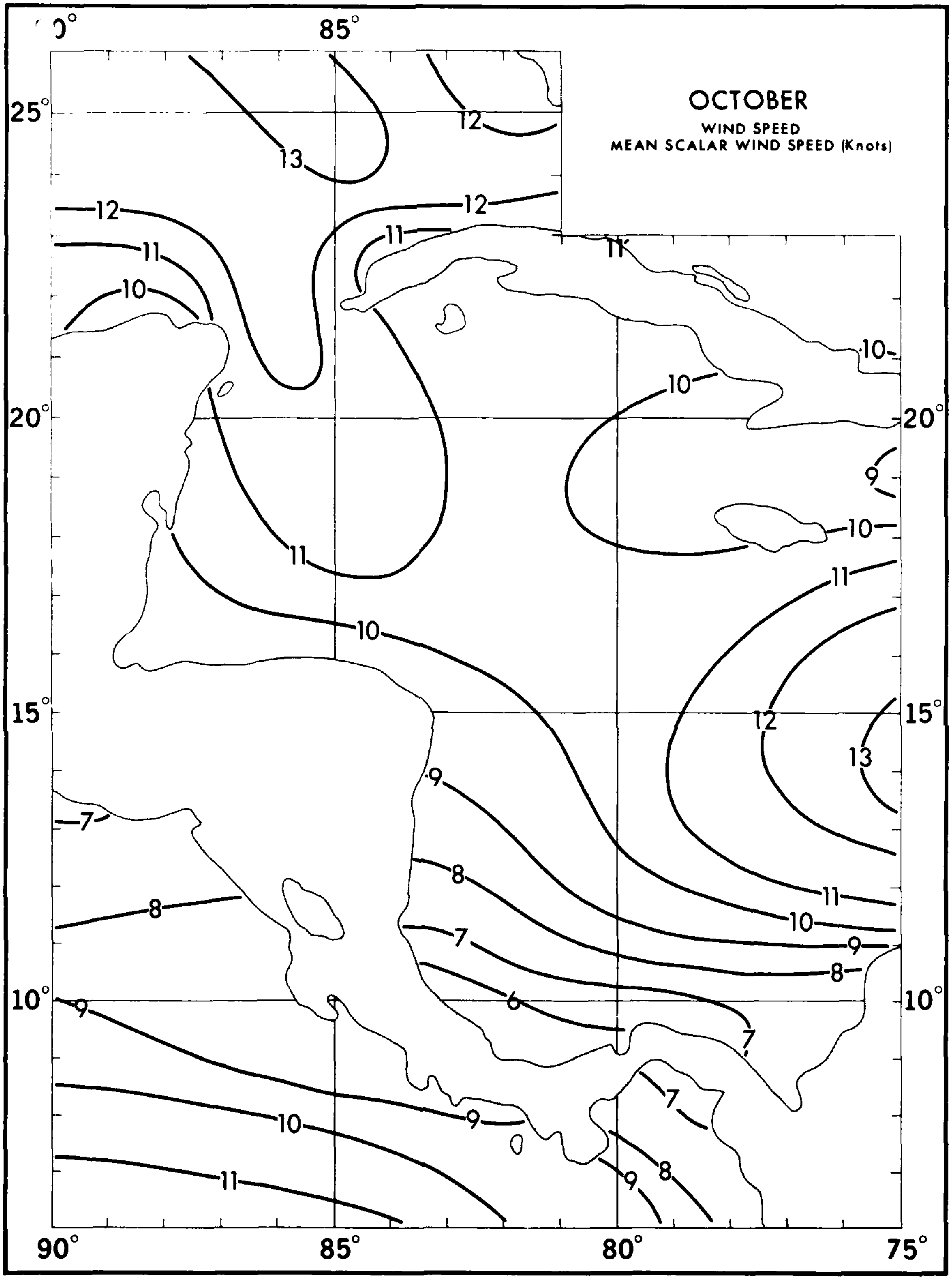

OCTOBER
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
30
10
15
40
20
25
50
60
70
35

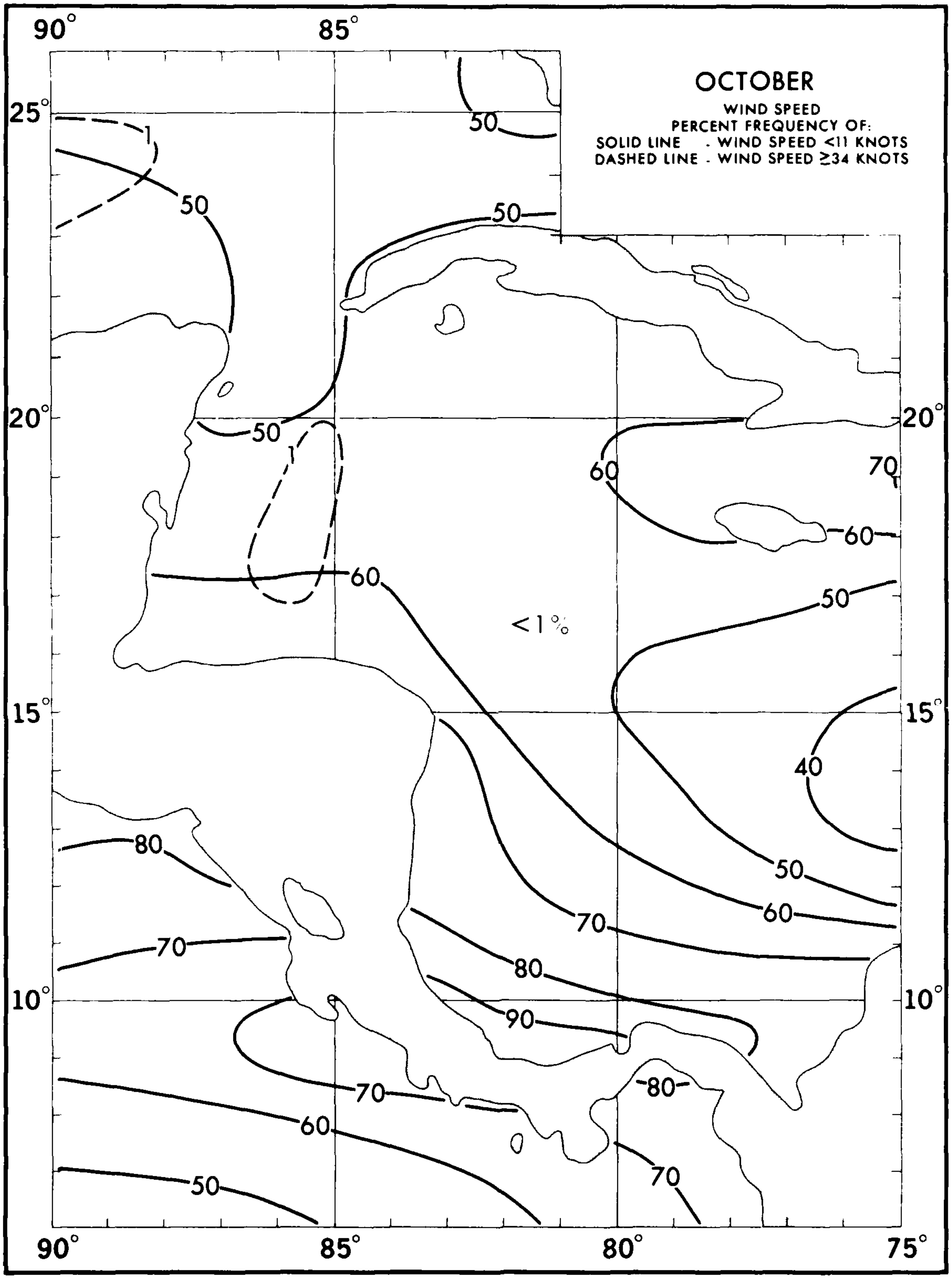


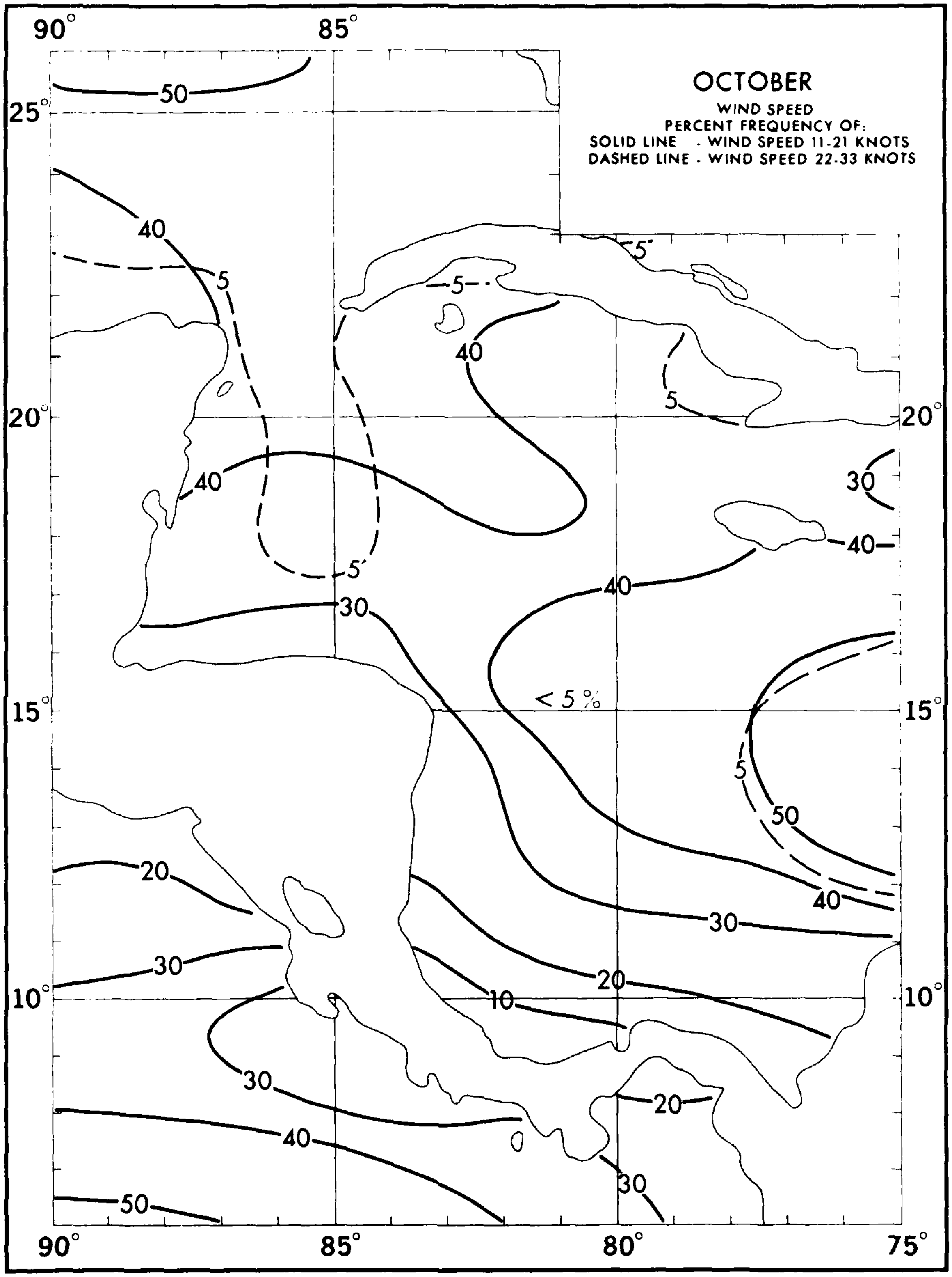
OCTOBER
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
<1%
90°
85°
80°
75°
25°
20°
15°
10°



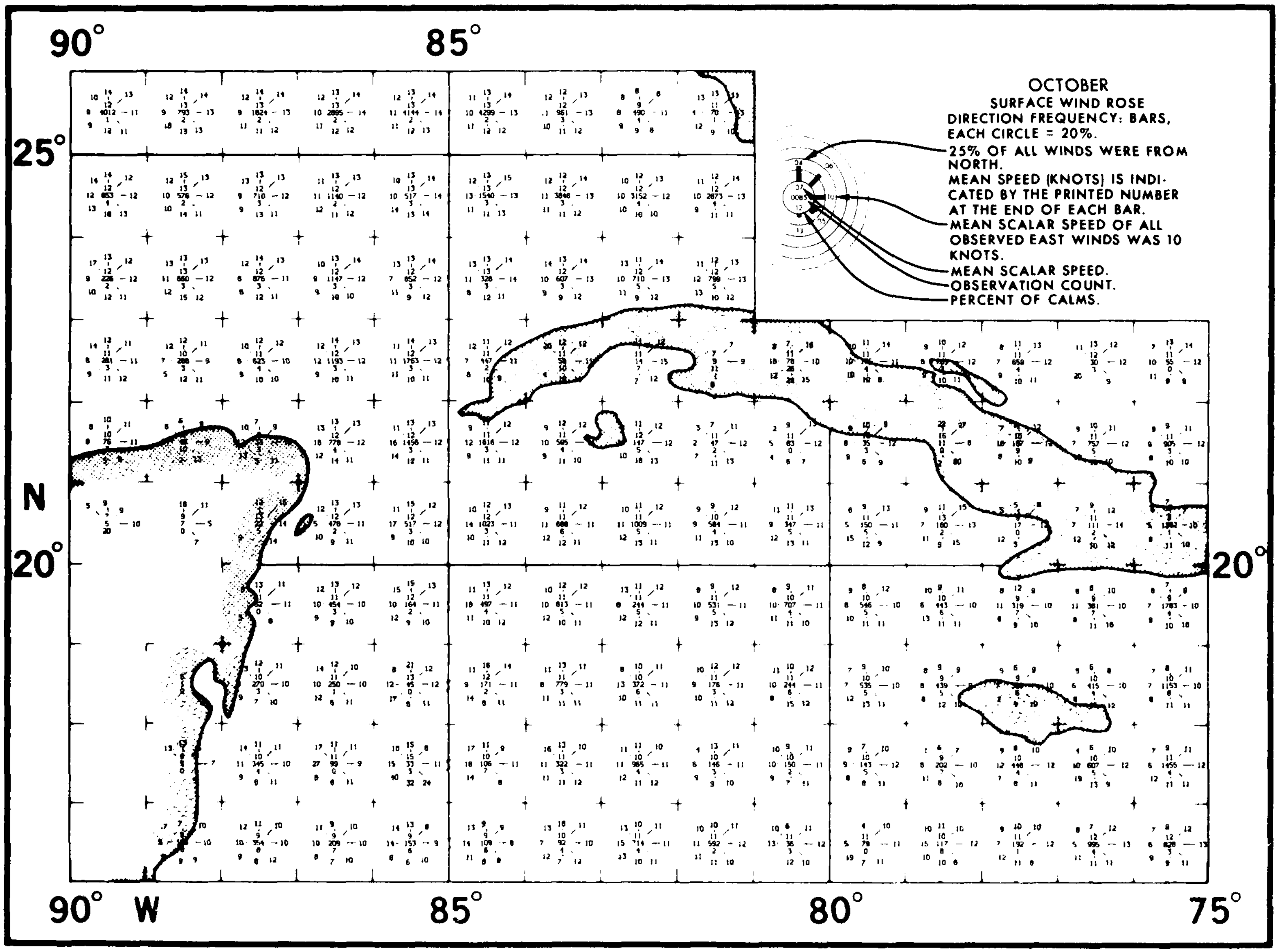
OCTOBER
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°

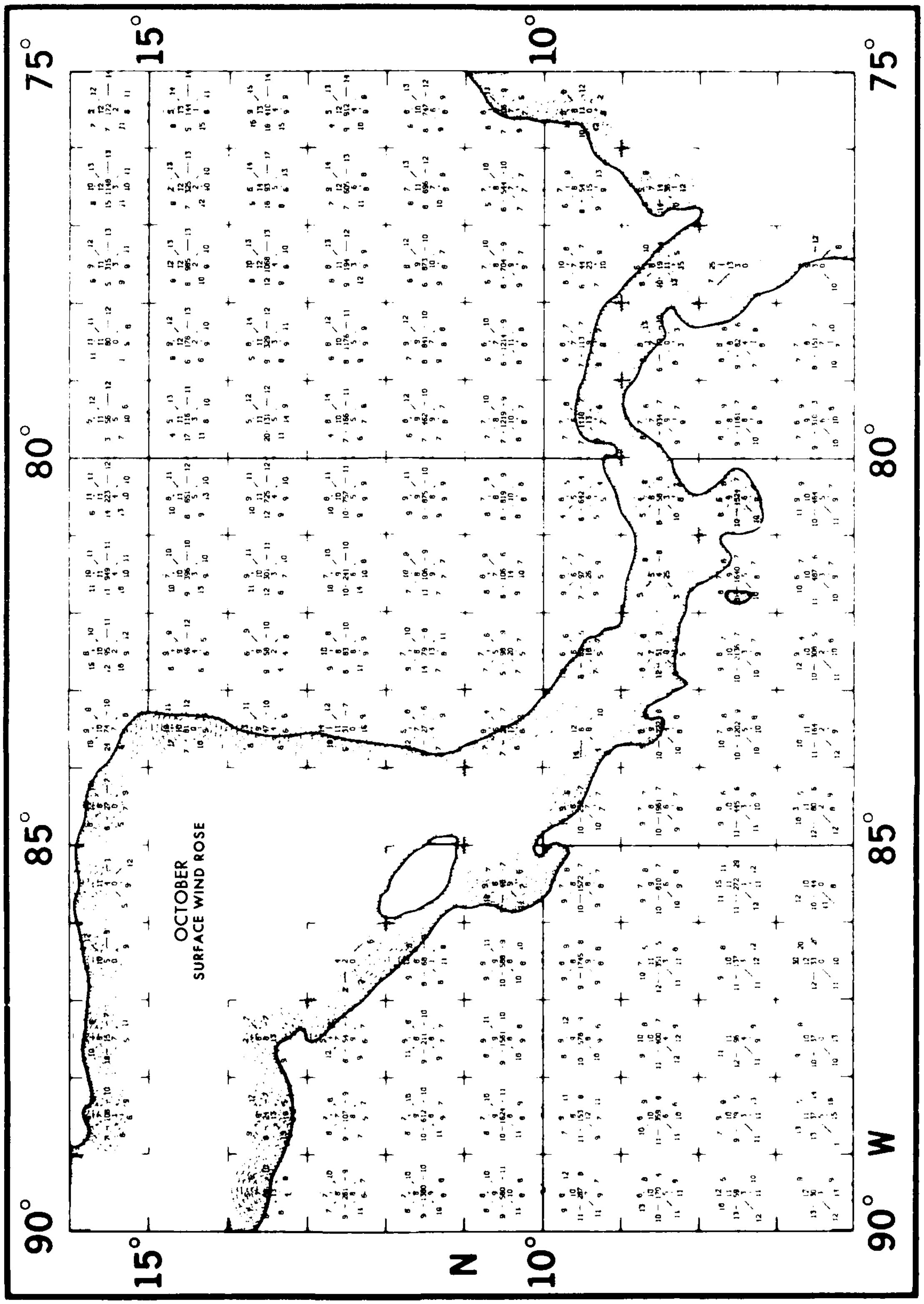

OCTOBER
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°
13
12
11
10
9
8
7
6

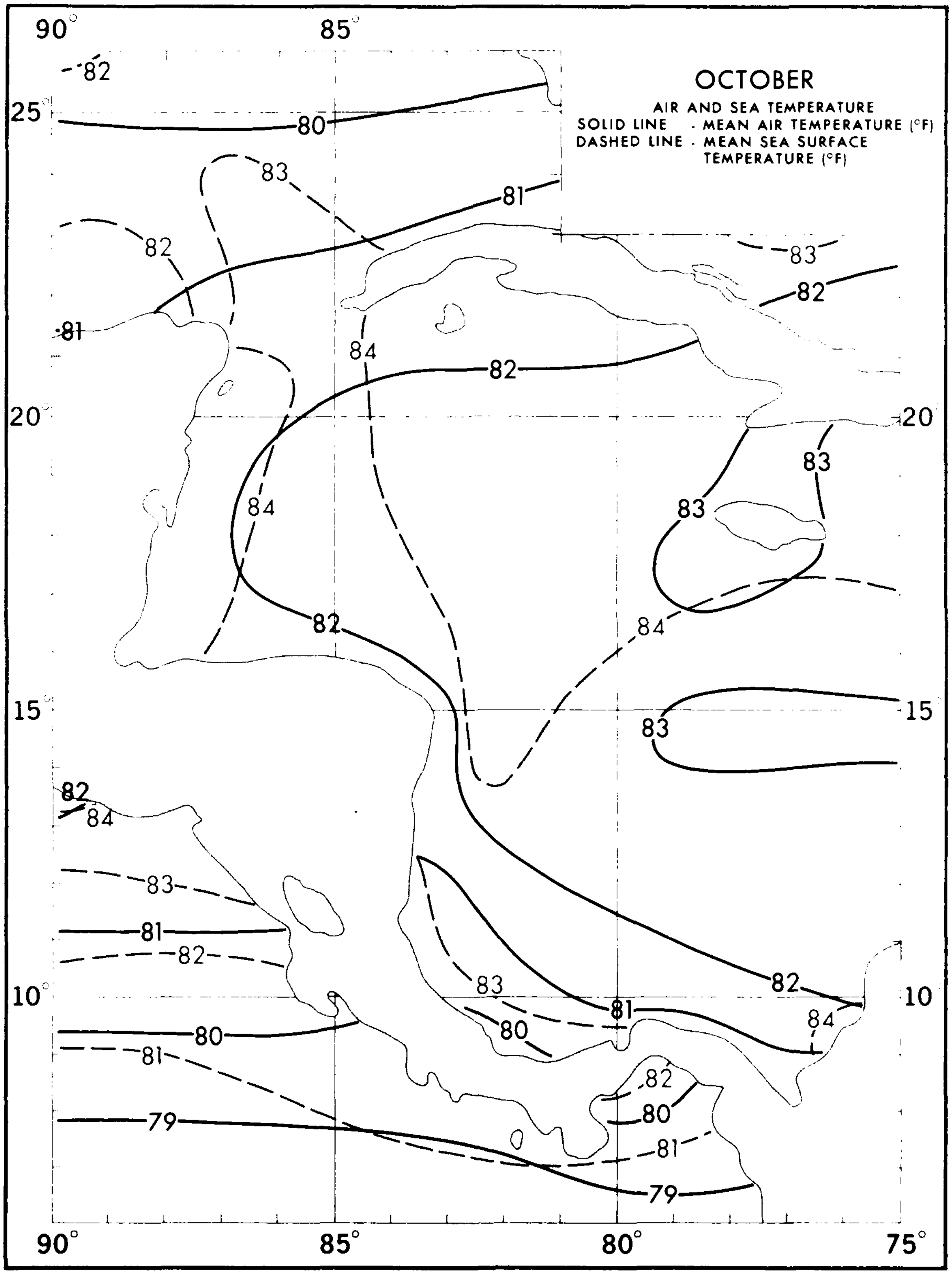

OCTOBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°
50
1
60
70
80
90
40
<1%

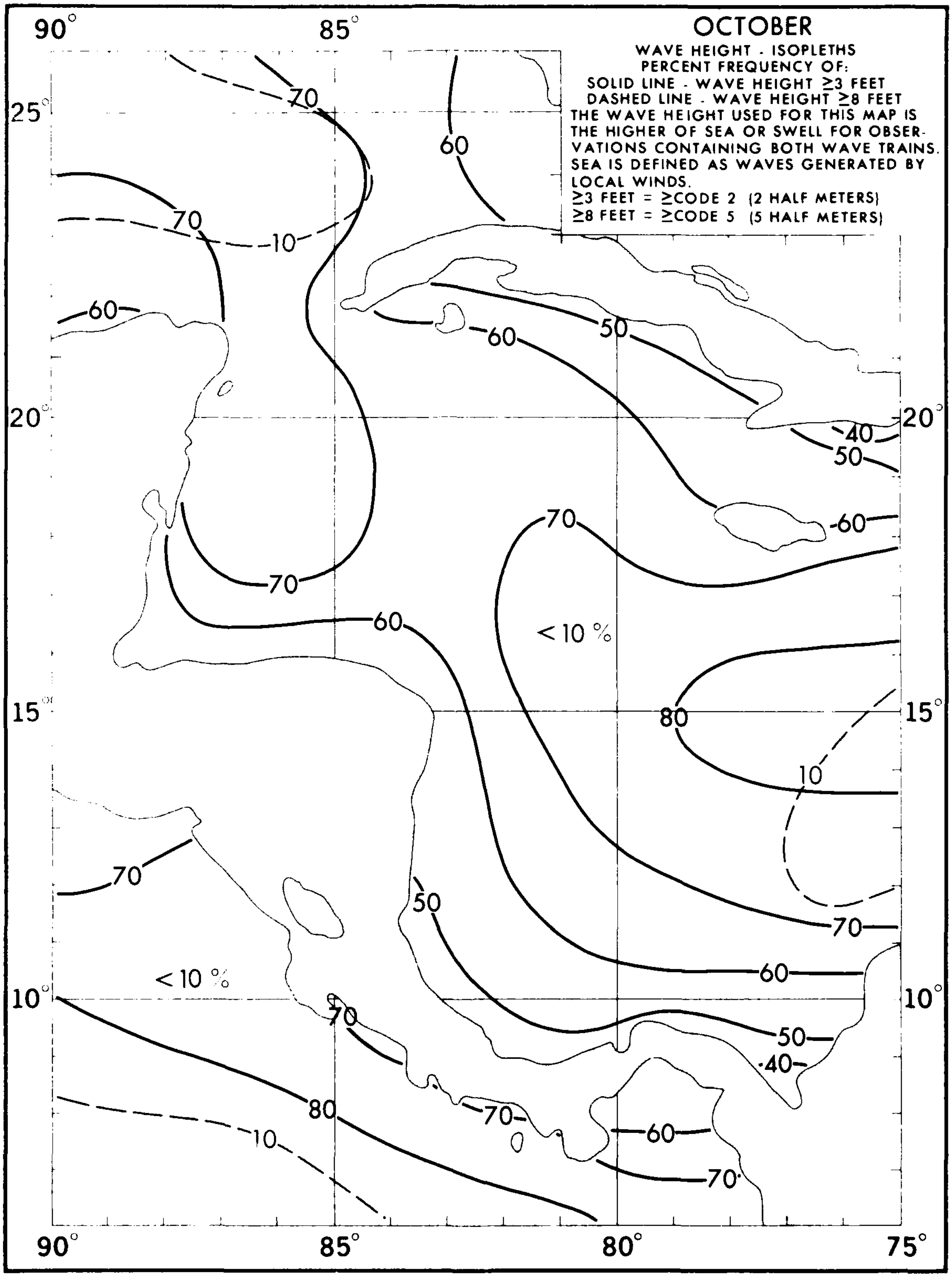


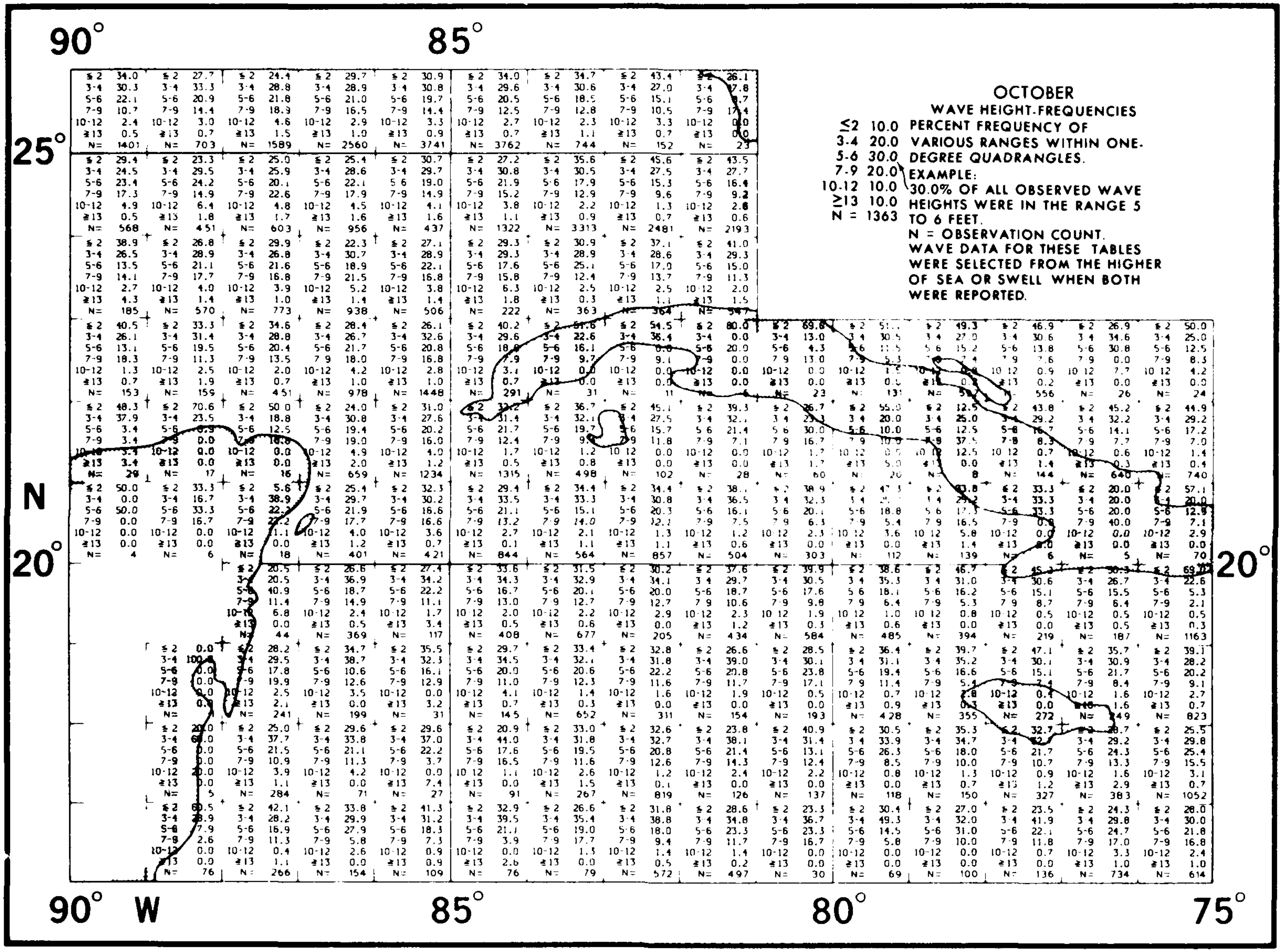
OCTOBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°
50
40
30
20
10
5
< 5 %

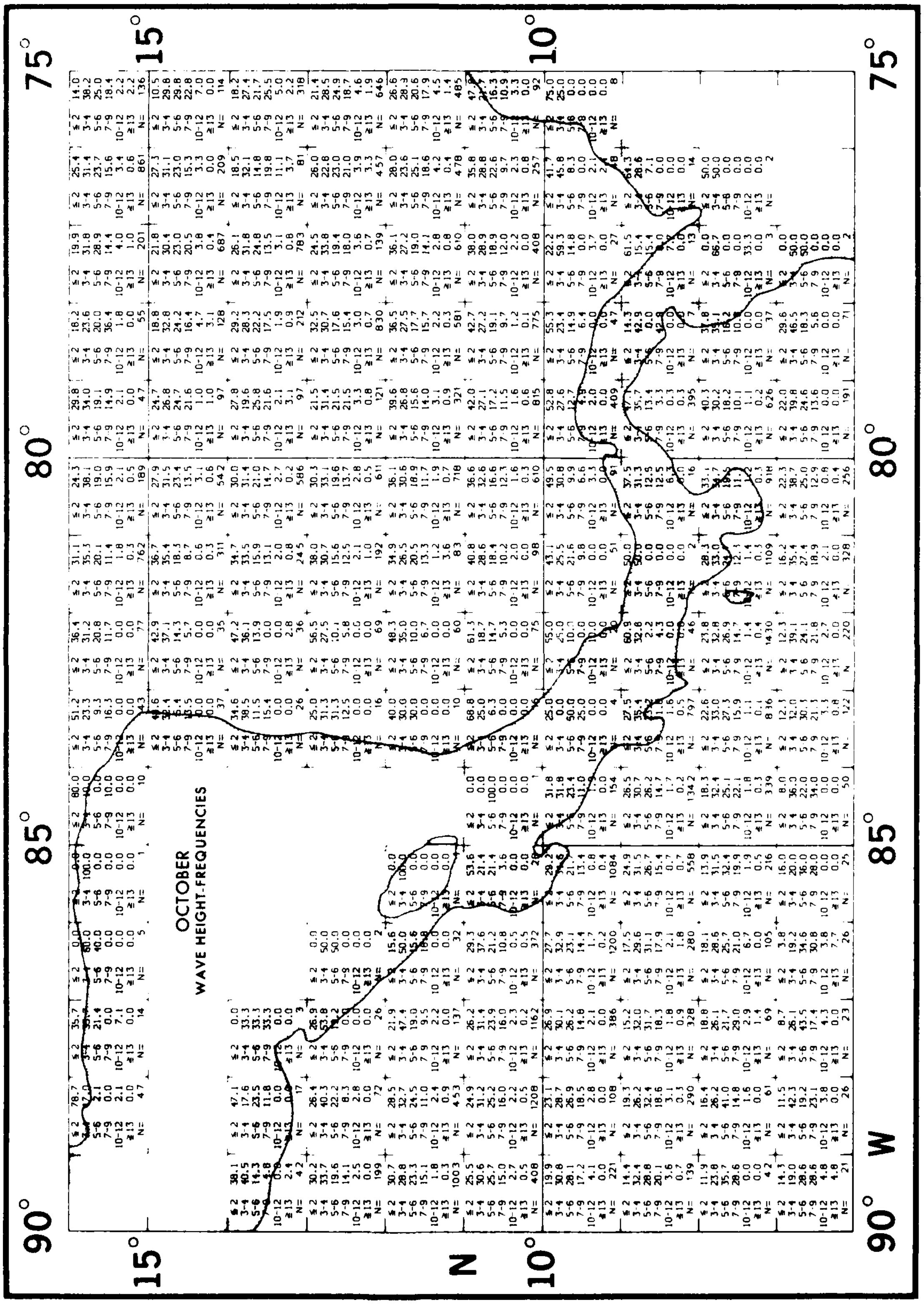

OCTOBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
25°
N
20°
20°
90° W
85°
80°
75°

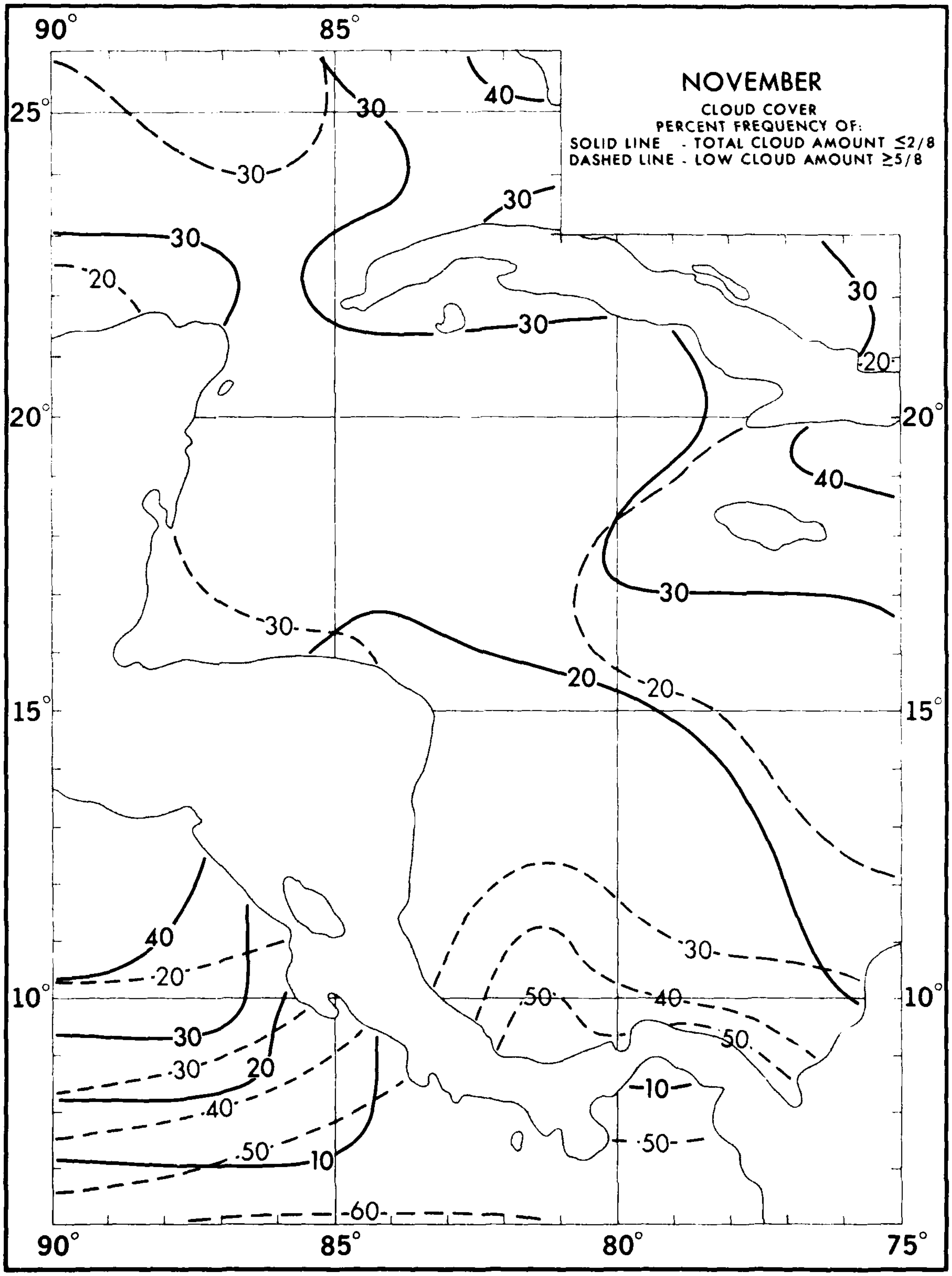

OCTOBER
SURFACE WIND ROSE
90°
85°
80°
75°
15°
10°
N
W

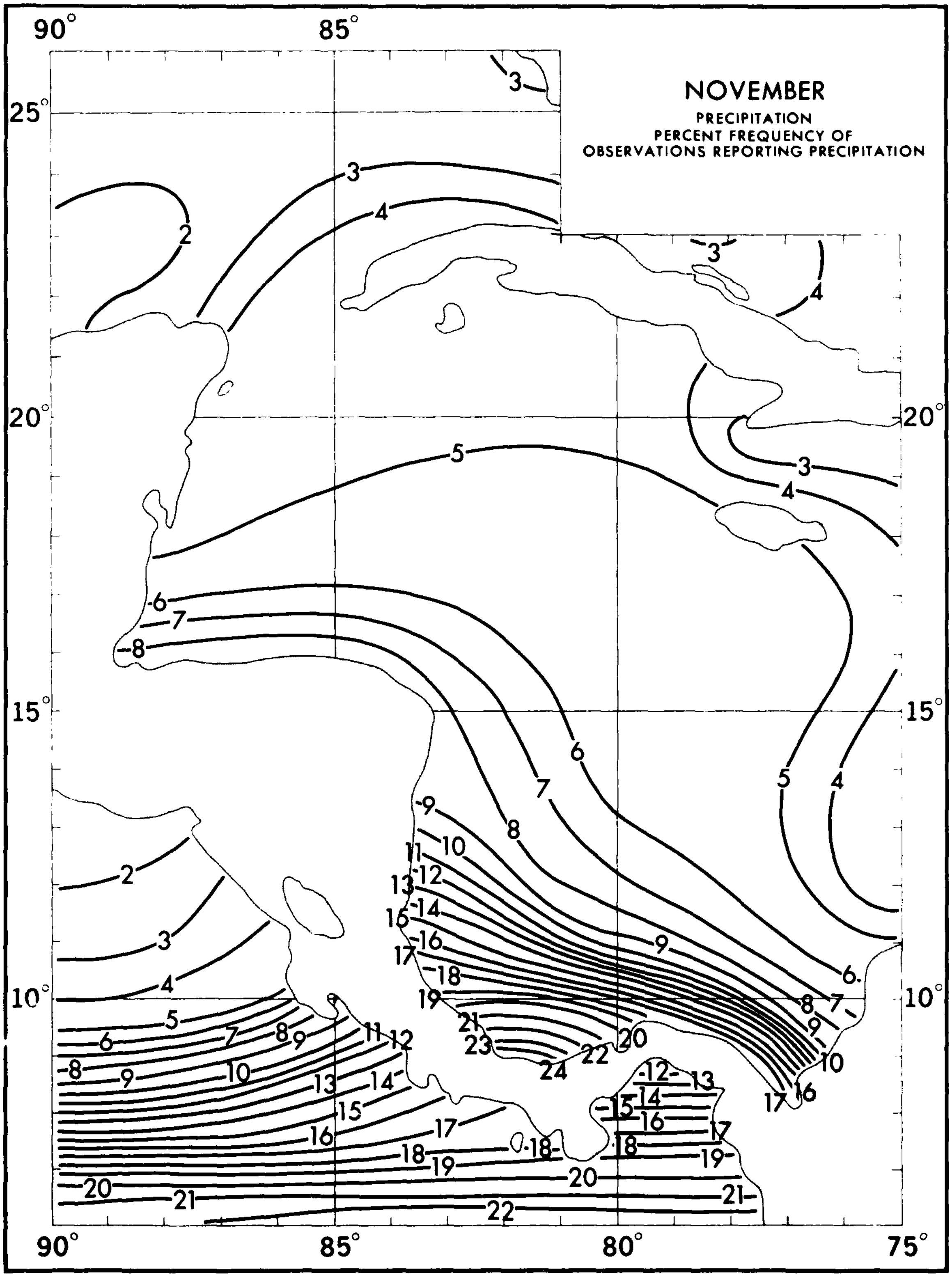

OCTOBER
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90° 85° 80° 75°
25° 20° 15° 10°
82 80 83 81 82 83 82 81 84 82 20 83 83 84 84 82 84 15 83 82 84 83 81 82 83 82 10 81 84 80 80 81 82 80 79 81 79

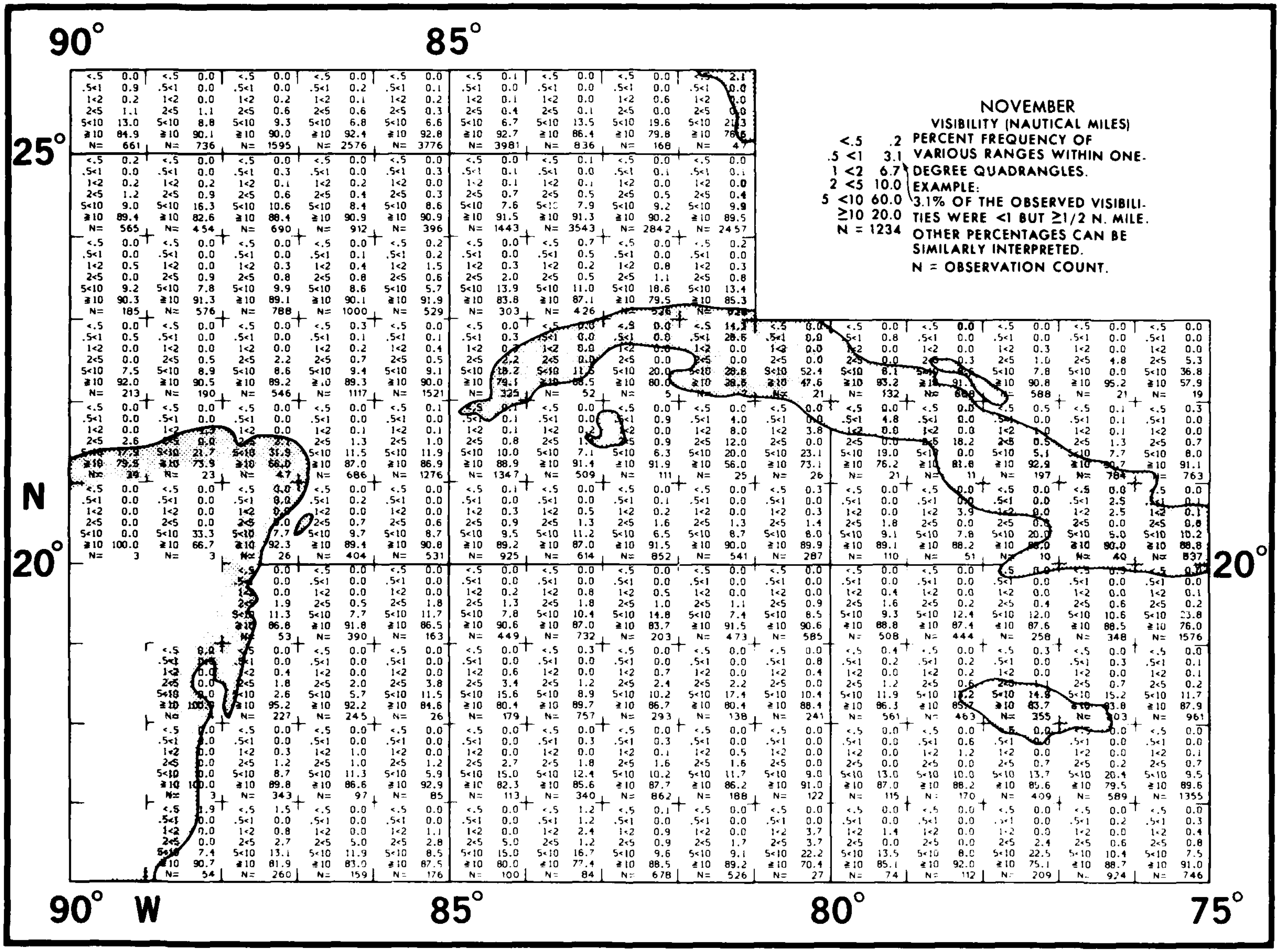

OCTOBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°
<10 %
<10 %
70
60
10
50
40
80

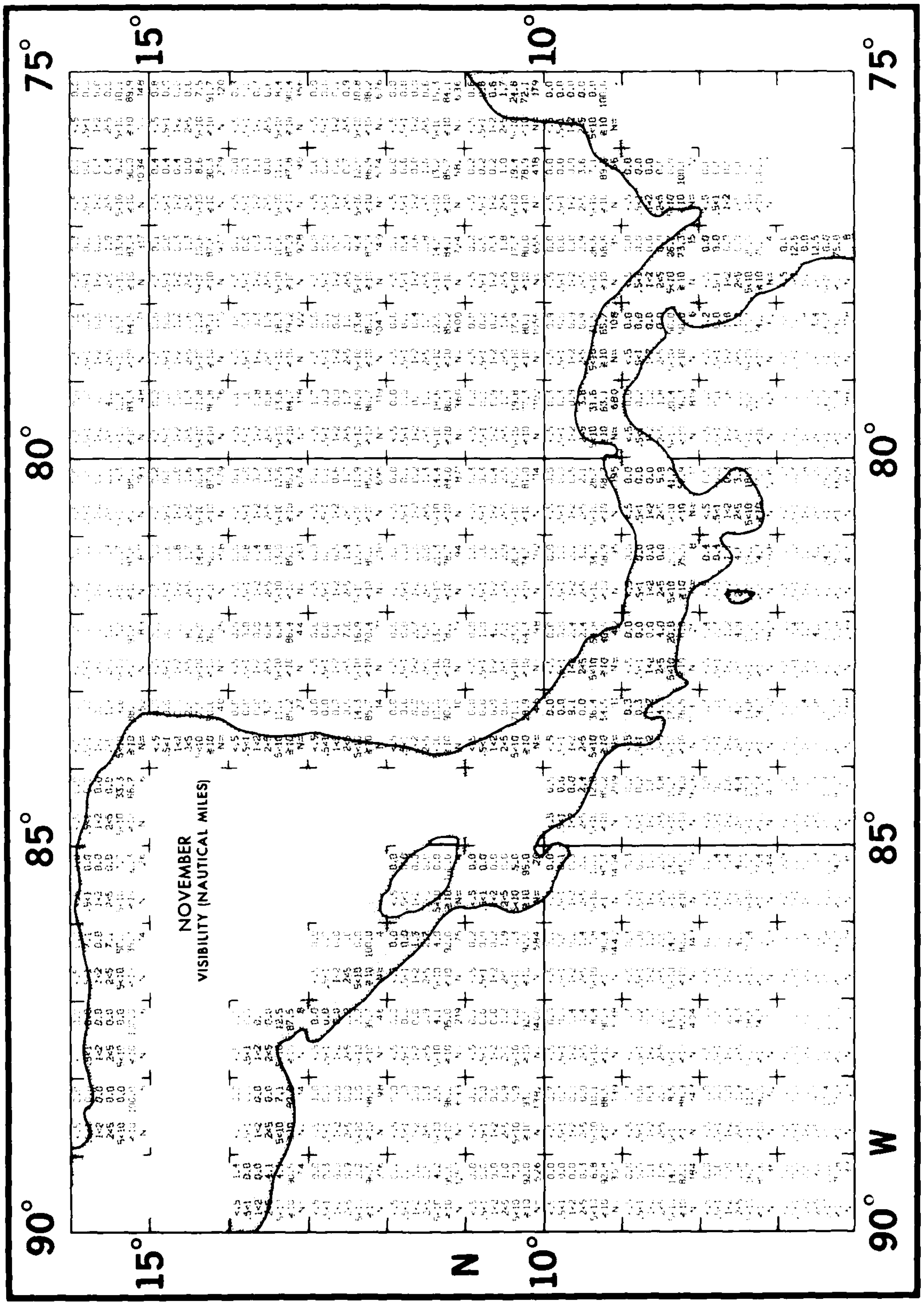

OCTOBER
WAVE HEIGHT-FREQUENCIES
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
90°
85°
80°
75°
90° W
25°
N
20°
20°

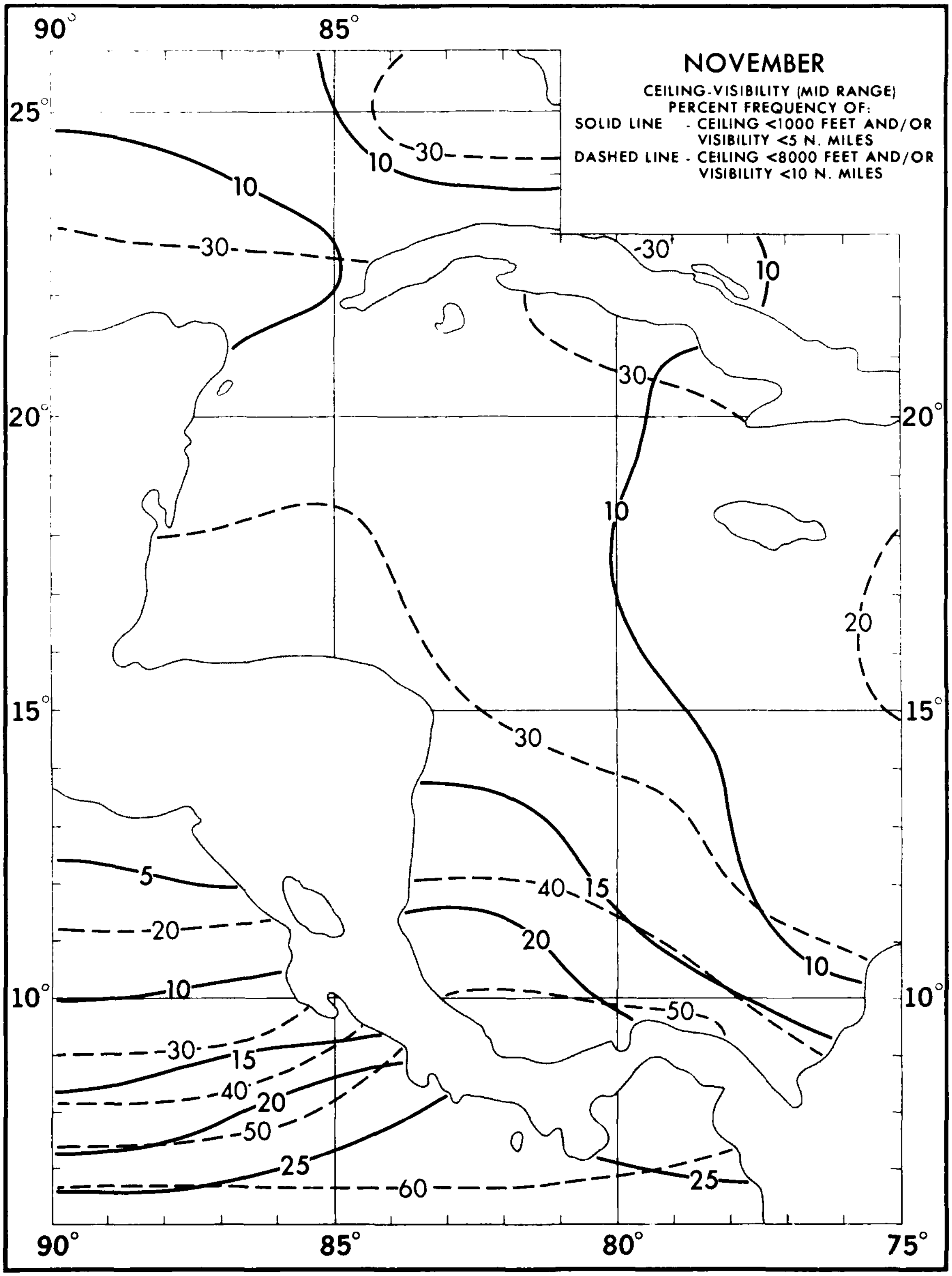

OCTOBER
WAVE HEIGHT-FREQUENCIES
90°
85°
80°
75°
W
15°
N
10°


NOVEMBER
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°

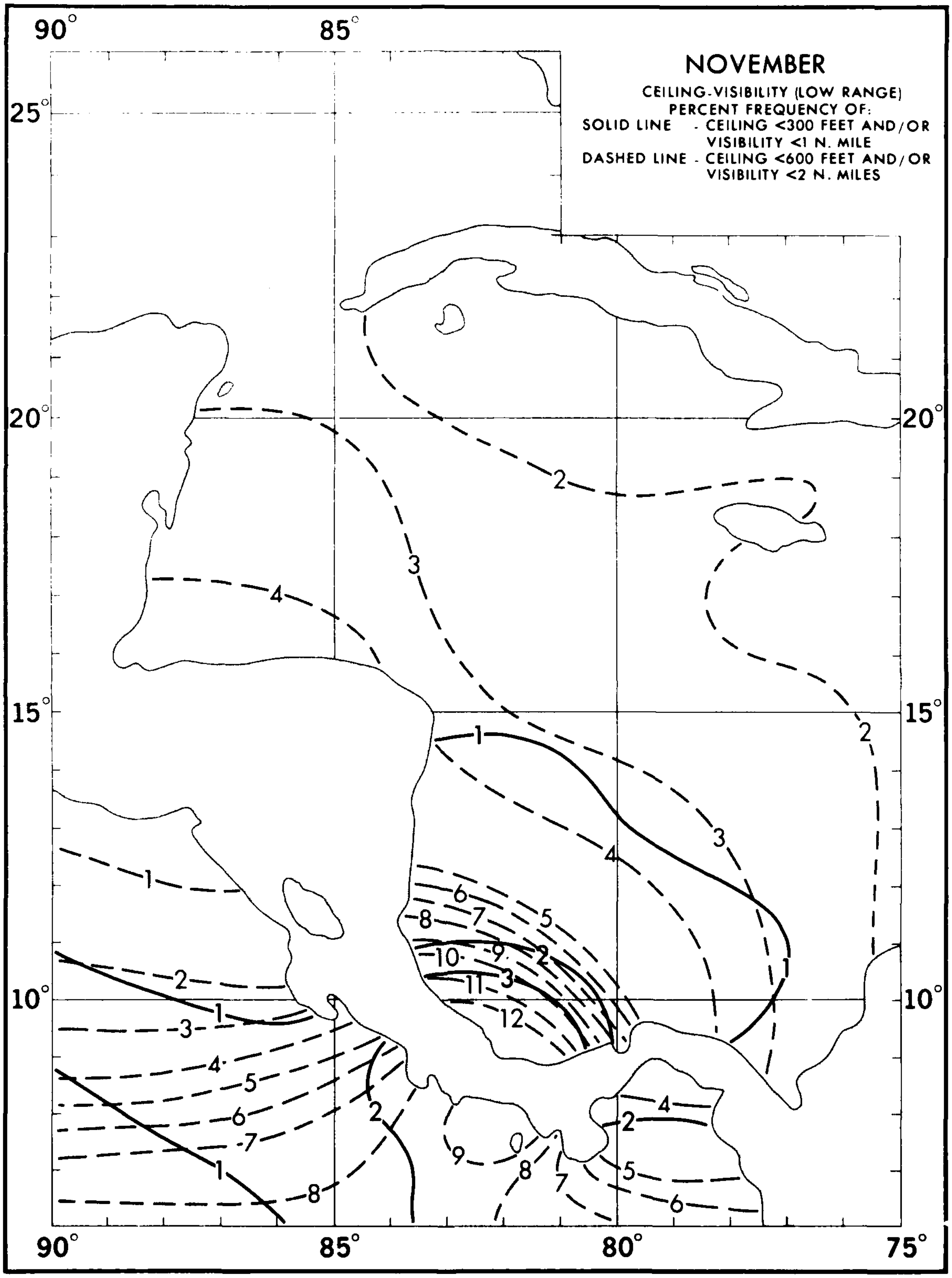

NOVEMBER
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°

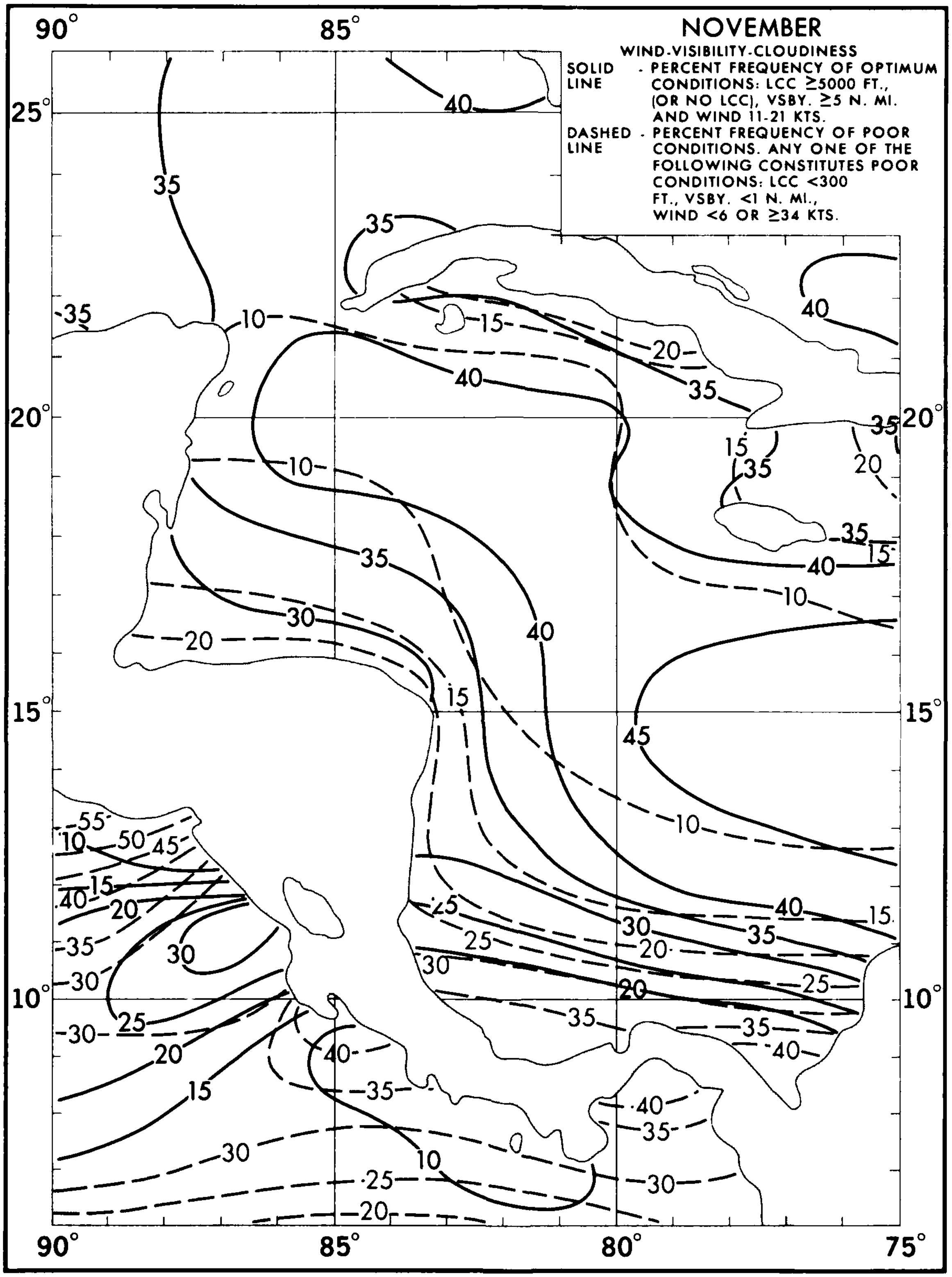

NOVEMBER
VISIBILITY (NAUTICAL MILES)
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE: 3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE. OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
80°
75°
25°
20°
N
W

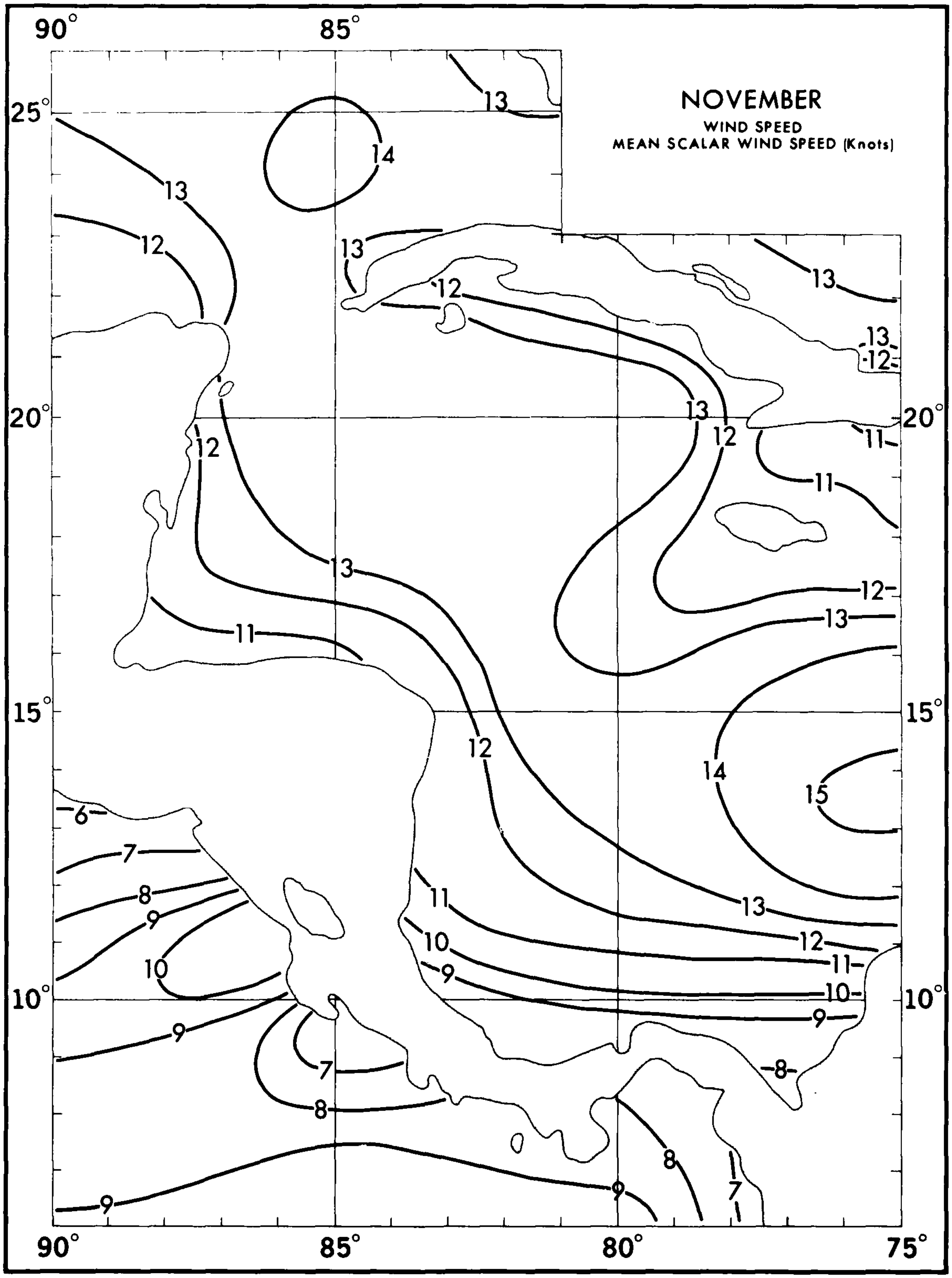

NOVEMBER
VISIBILITY (NAUTICAL MILES)
90° W
85°
80°
75°
15°
10°
N

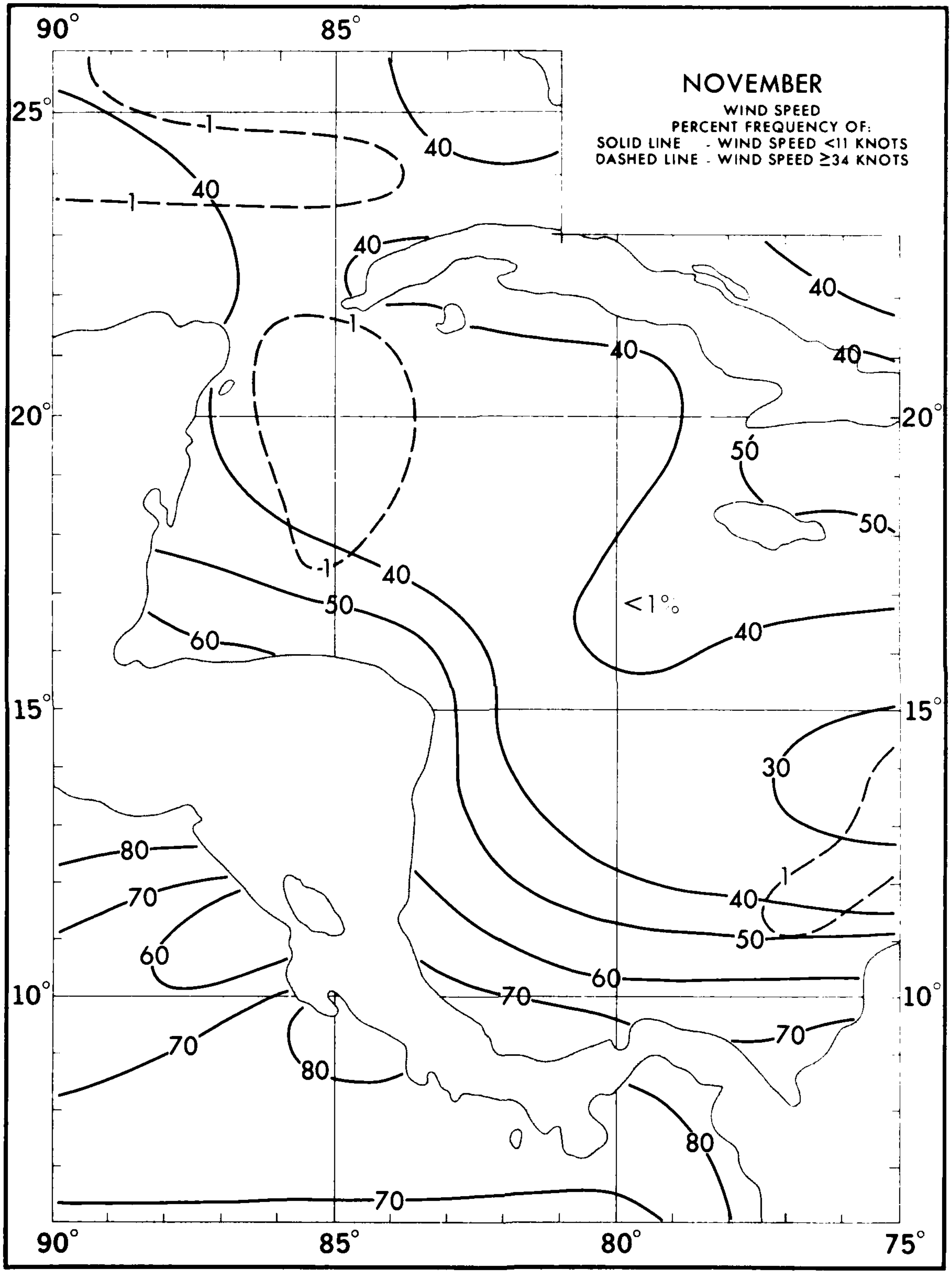


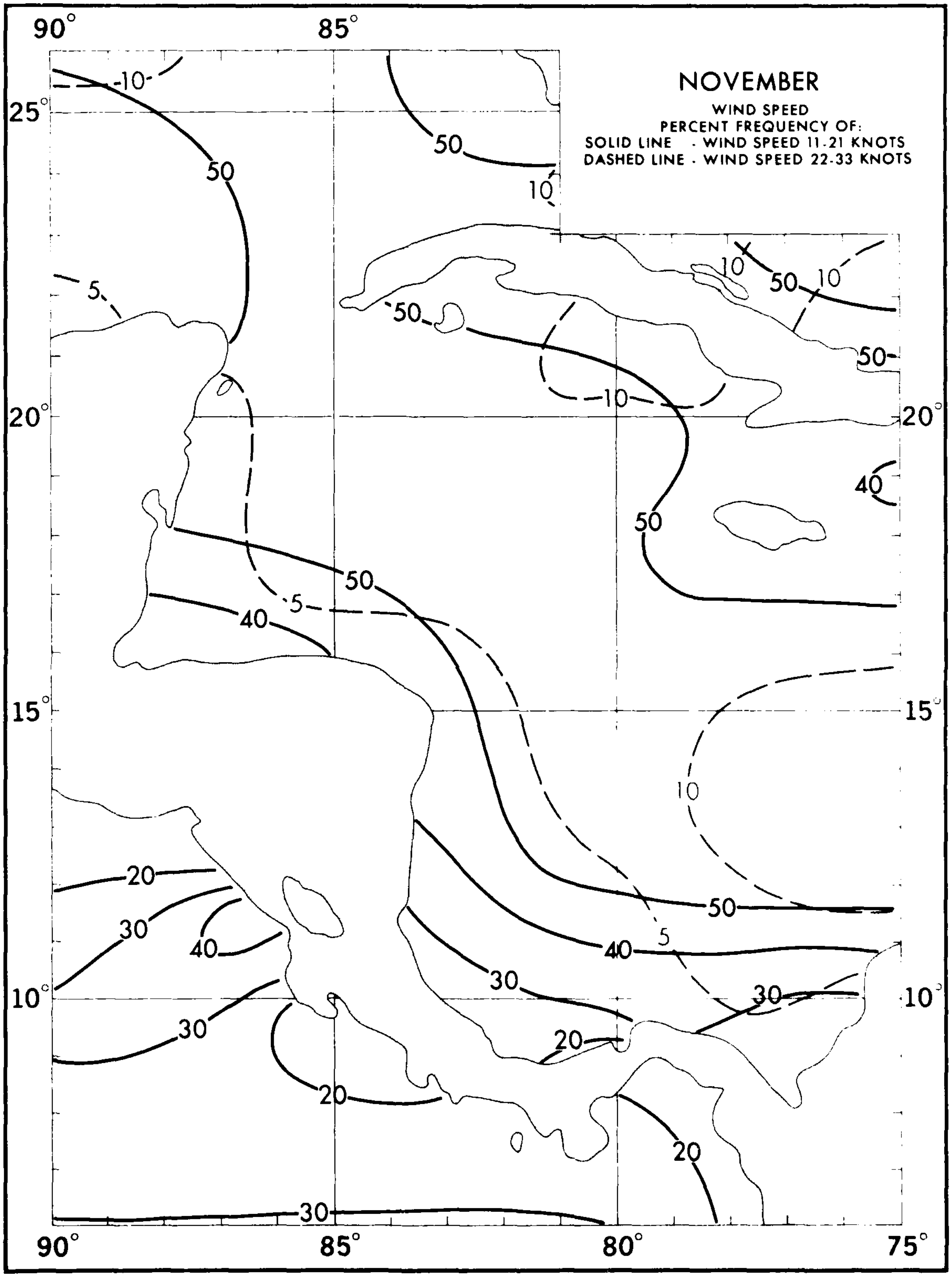
NOVEMBER
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
10
30
20
40
50
60
5
15
25


NOVEMBER
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°

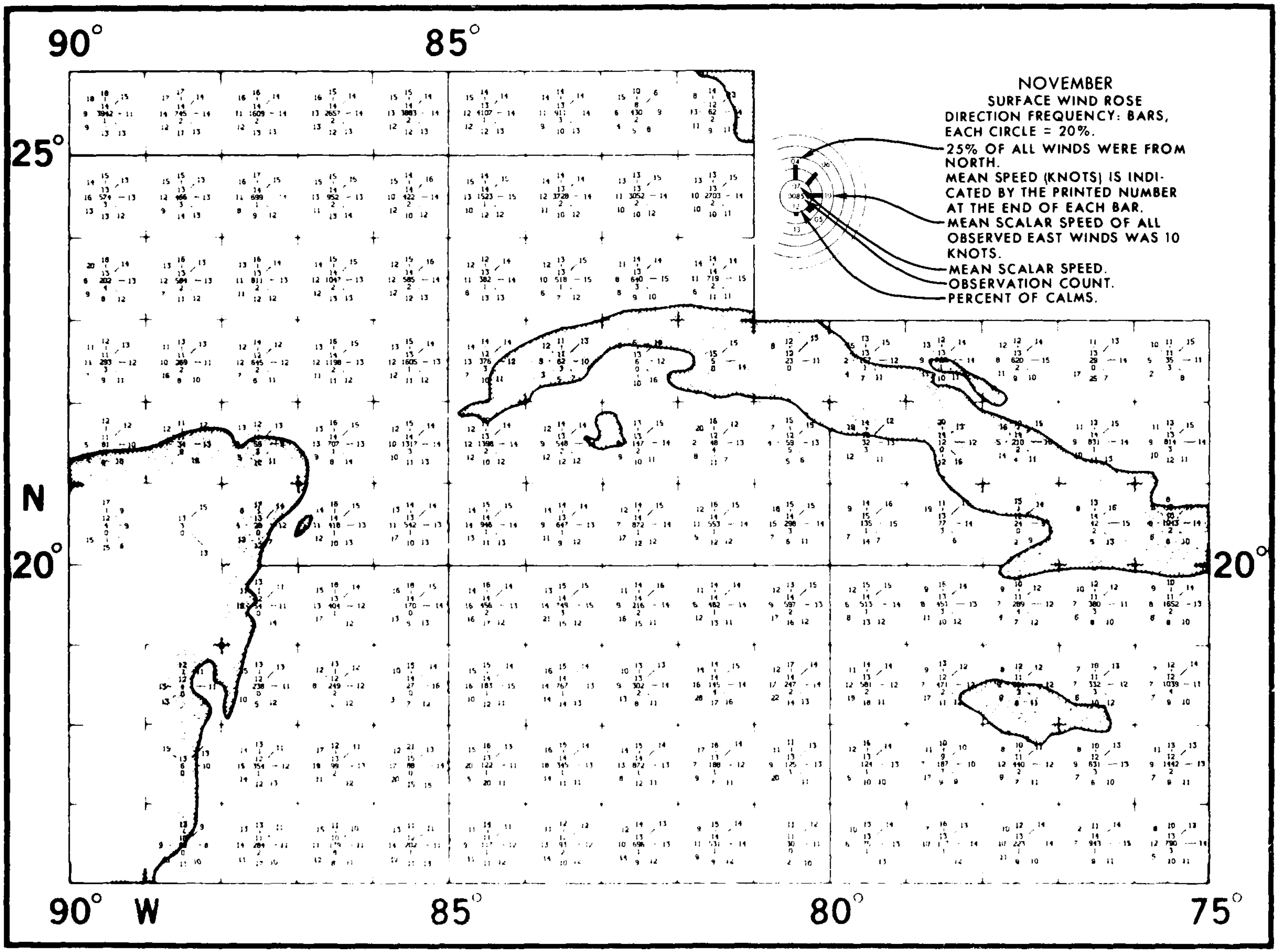

NOVEMBER
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°


NOVEMBER
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°
13
14
12
11
15
10
9
8
7
6


NOVEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°
40
1
50
60
70
80
30
<1%



NOVEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°


90°
85°
25°
NOVEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
N
20°
20°
90° W
85°
80°
75°

AD-A160 159 US NAVY CLIMATIC STUDY OF THE CARIBBEAN SEA AND GULF OF MEXICO VOLUME 1 W..(U) NAVAL OCEANOGRAPHY COMMAND NSTL STATION MS SEP 85 3/3

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DATE
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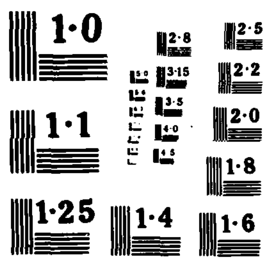
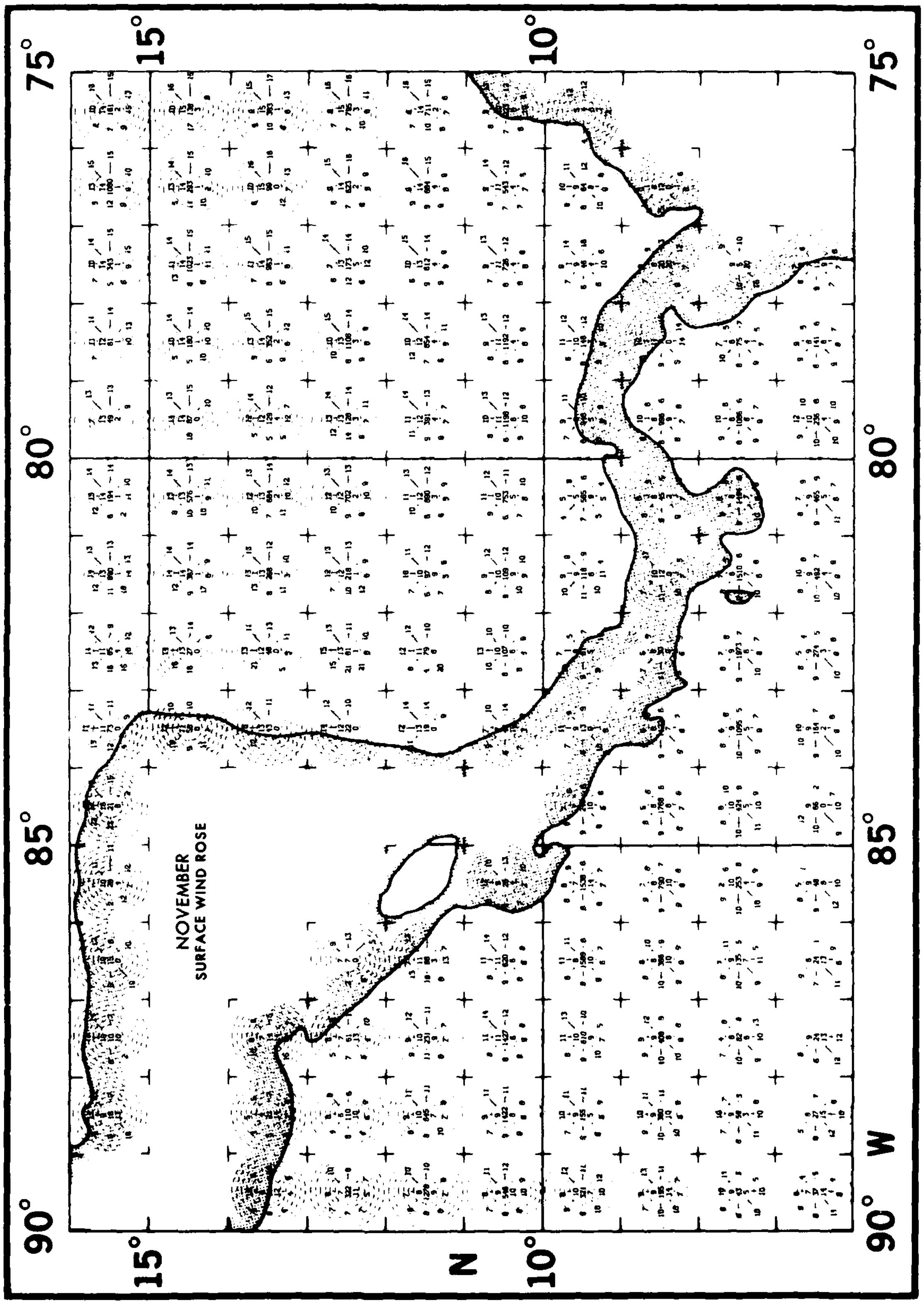
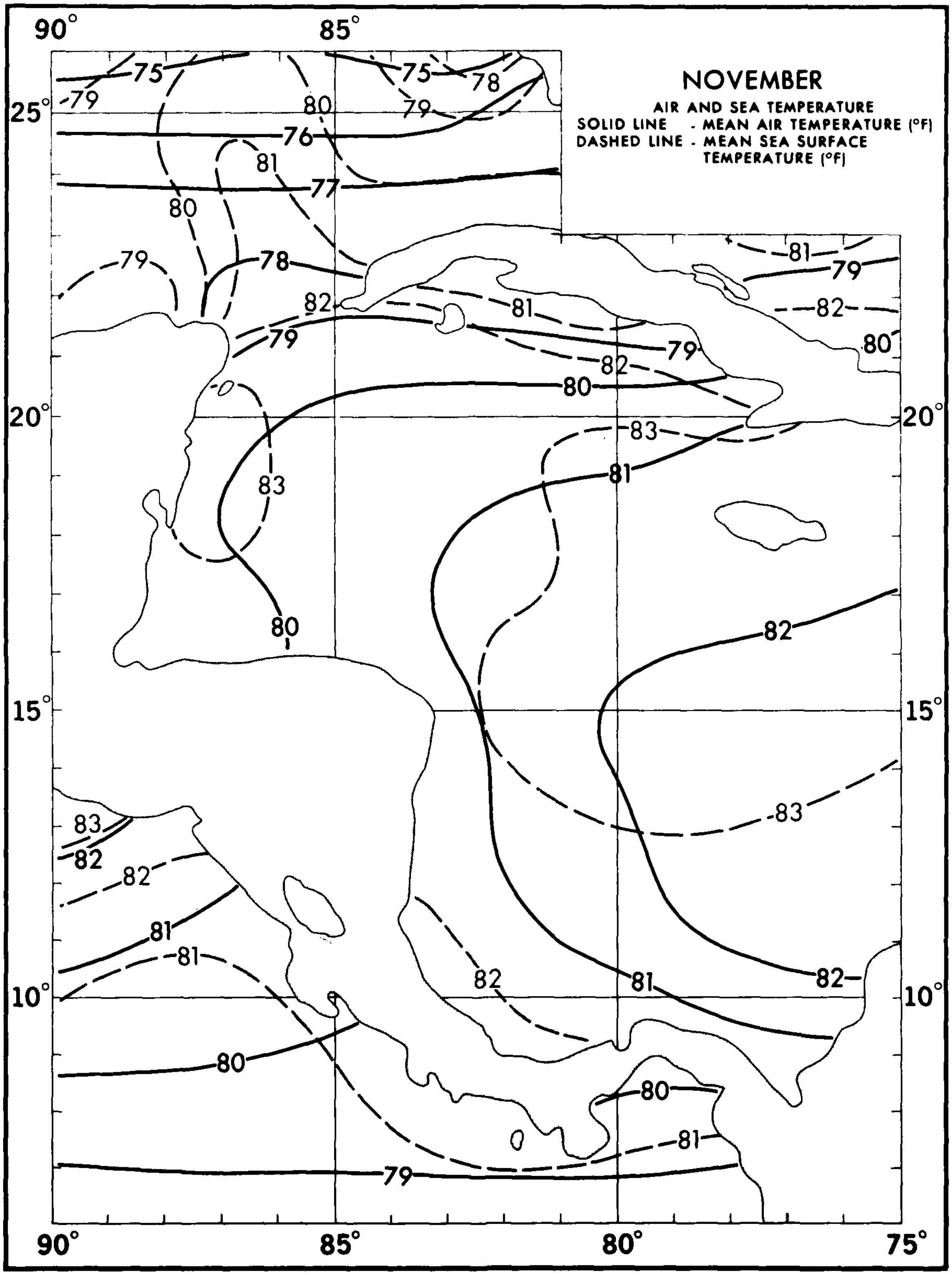
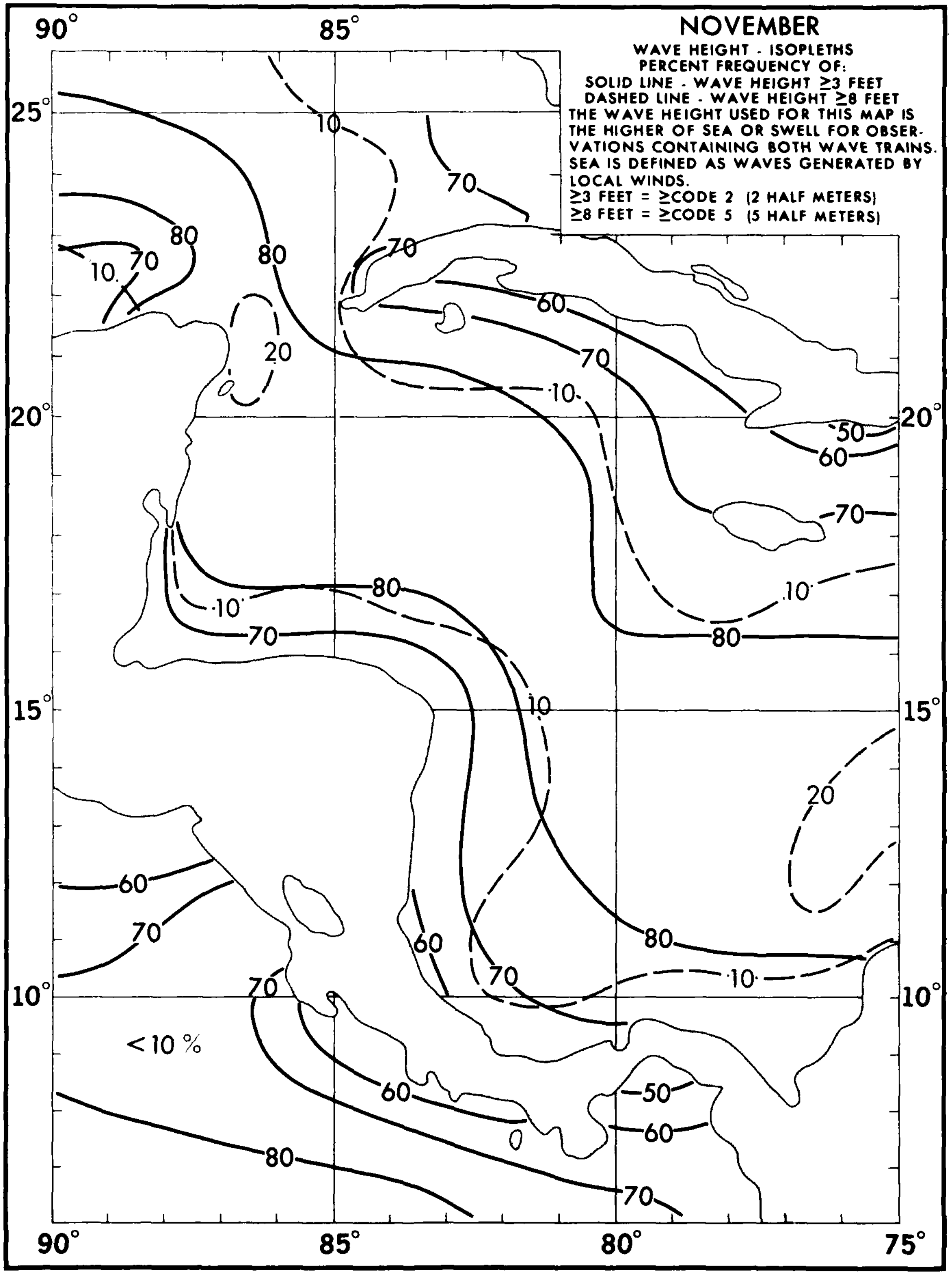
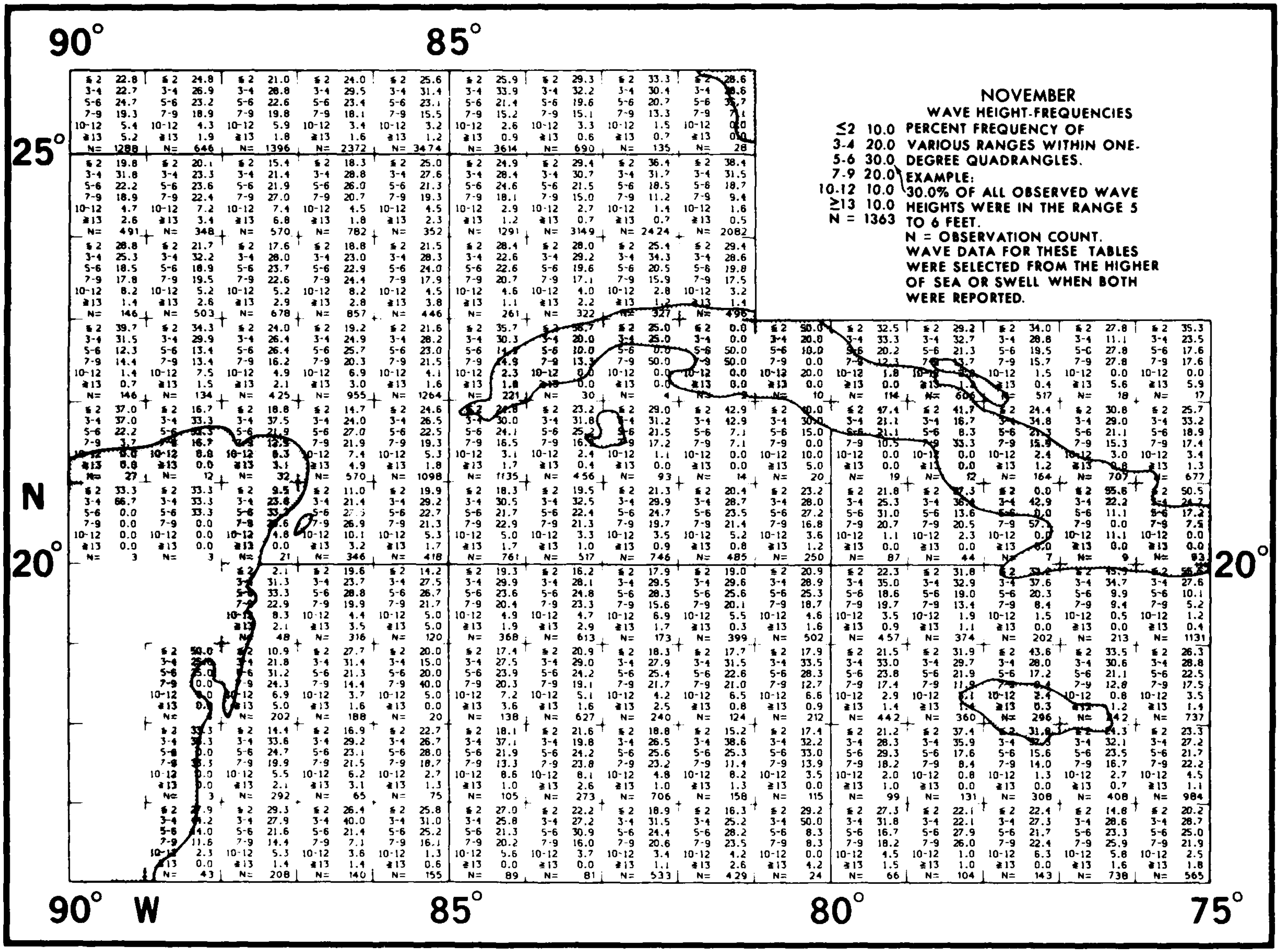
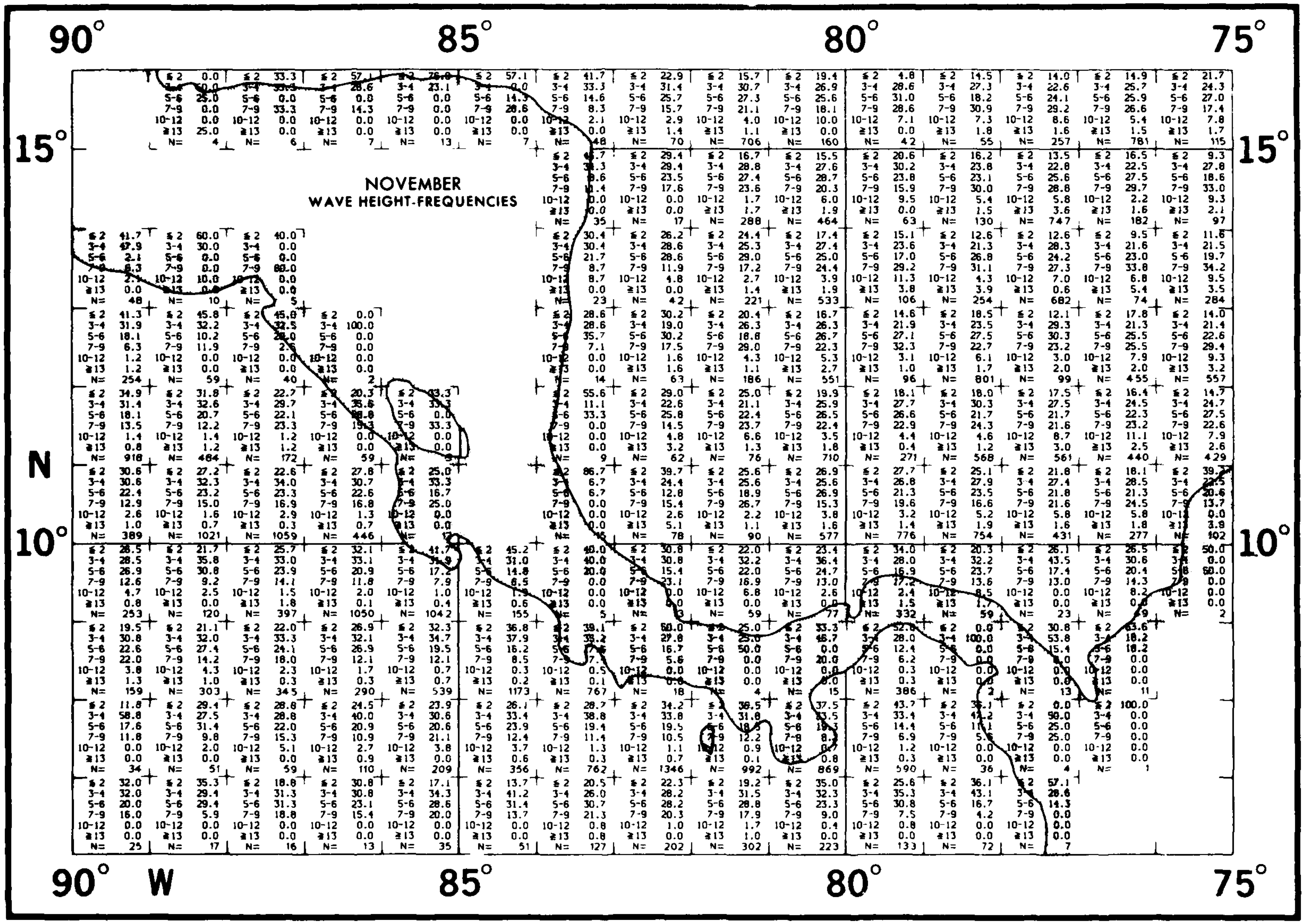

1·0
2·8
2·5
3·15
2·2
3·5
2·0
1·1
4·0
4·5
1·8
1·25
1·4
1·6

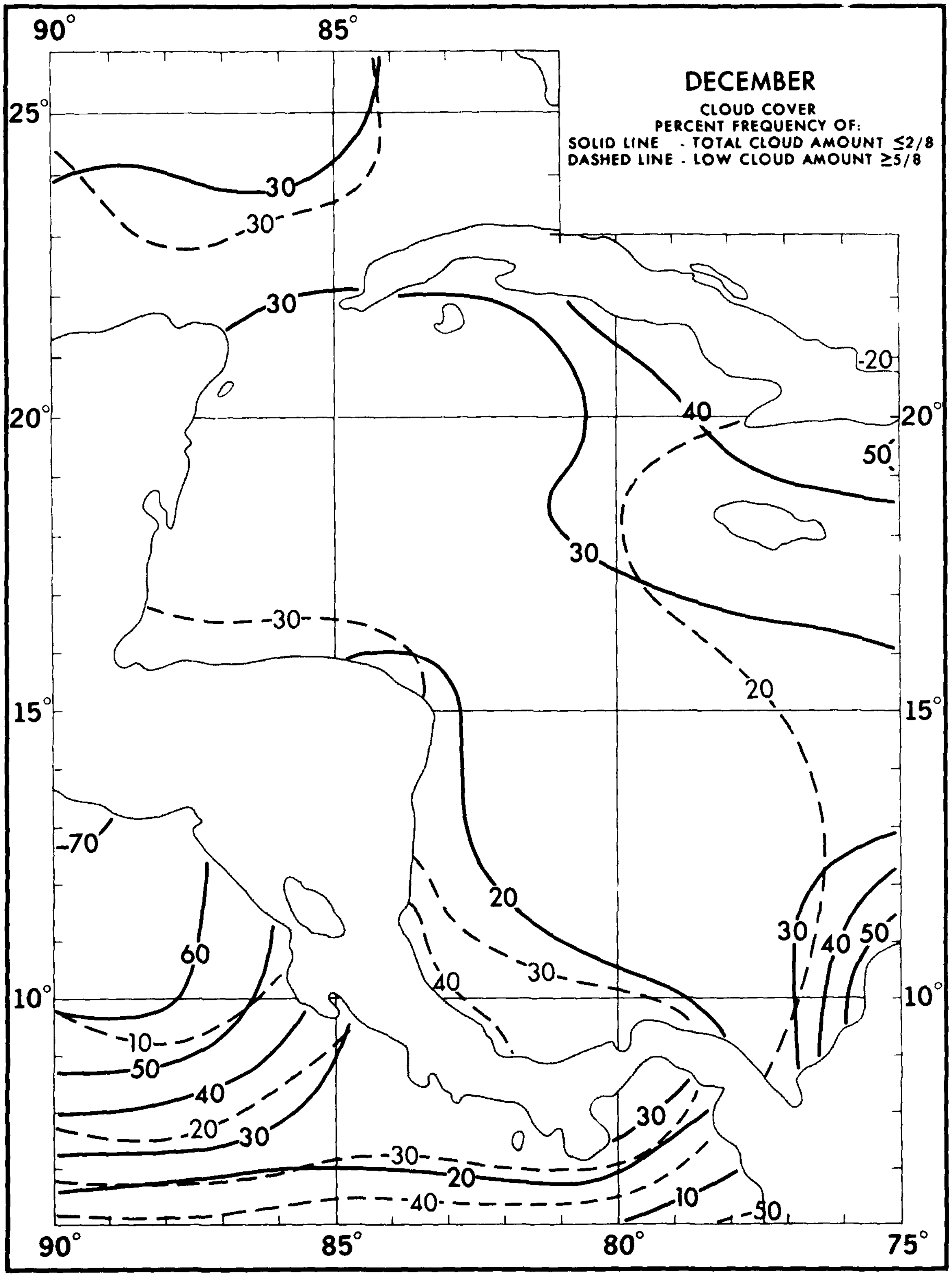

NOVEMBER
SURFACE WIND ROSE
90°
85°
80°
75°
15°
10°
N
W

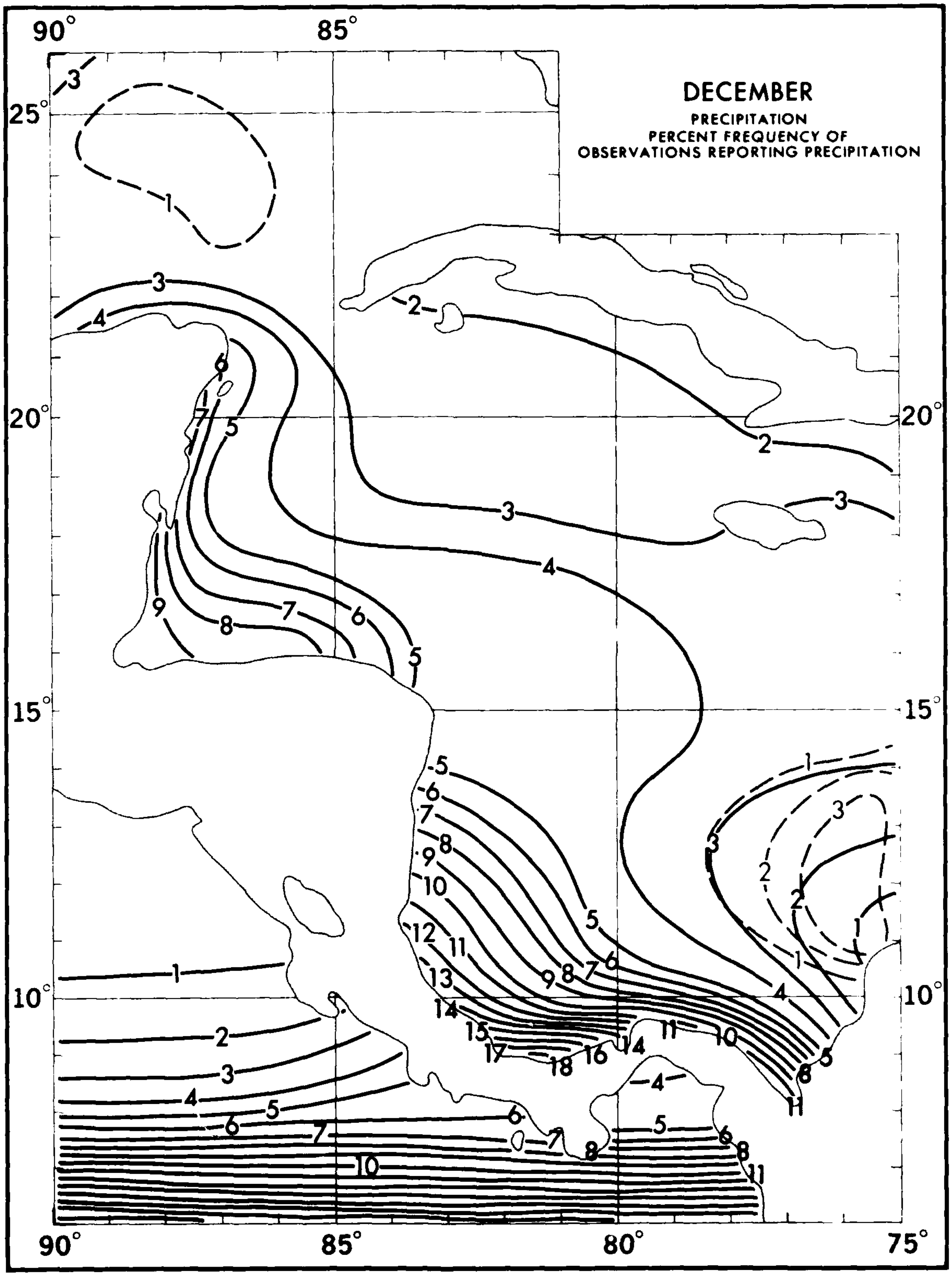

NOVEMBER
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°

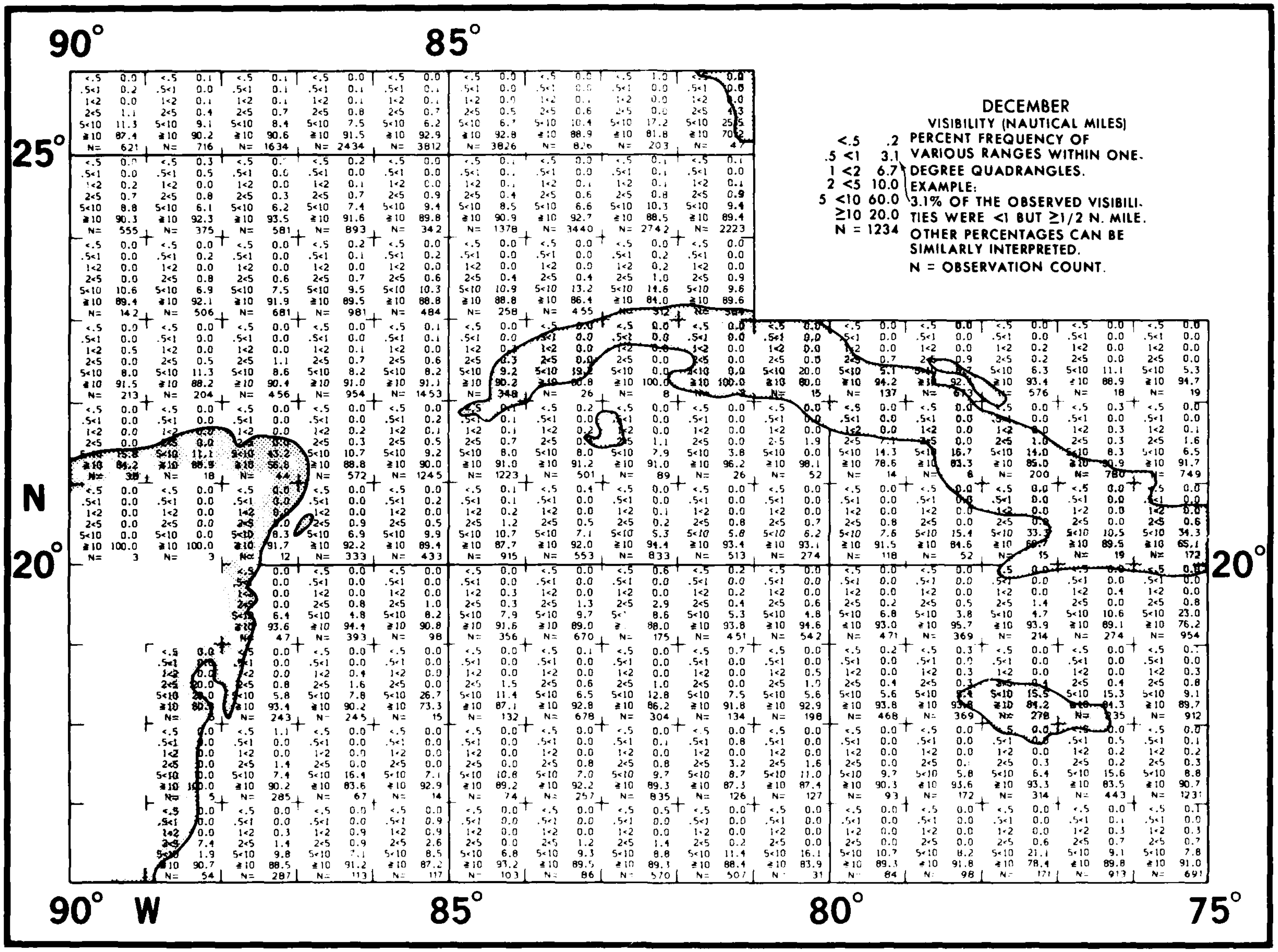

NOVEMBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°
<10 %
10
20
50
60
70
80

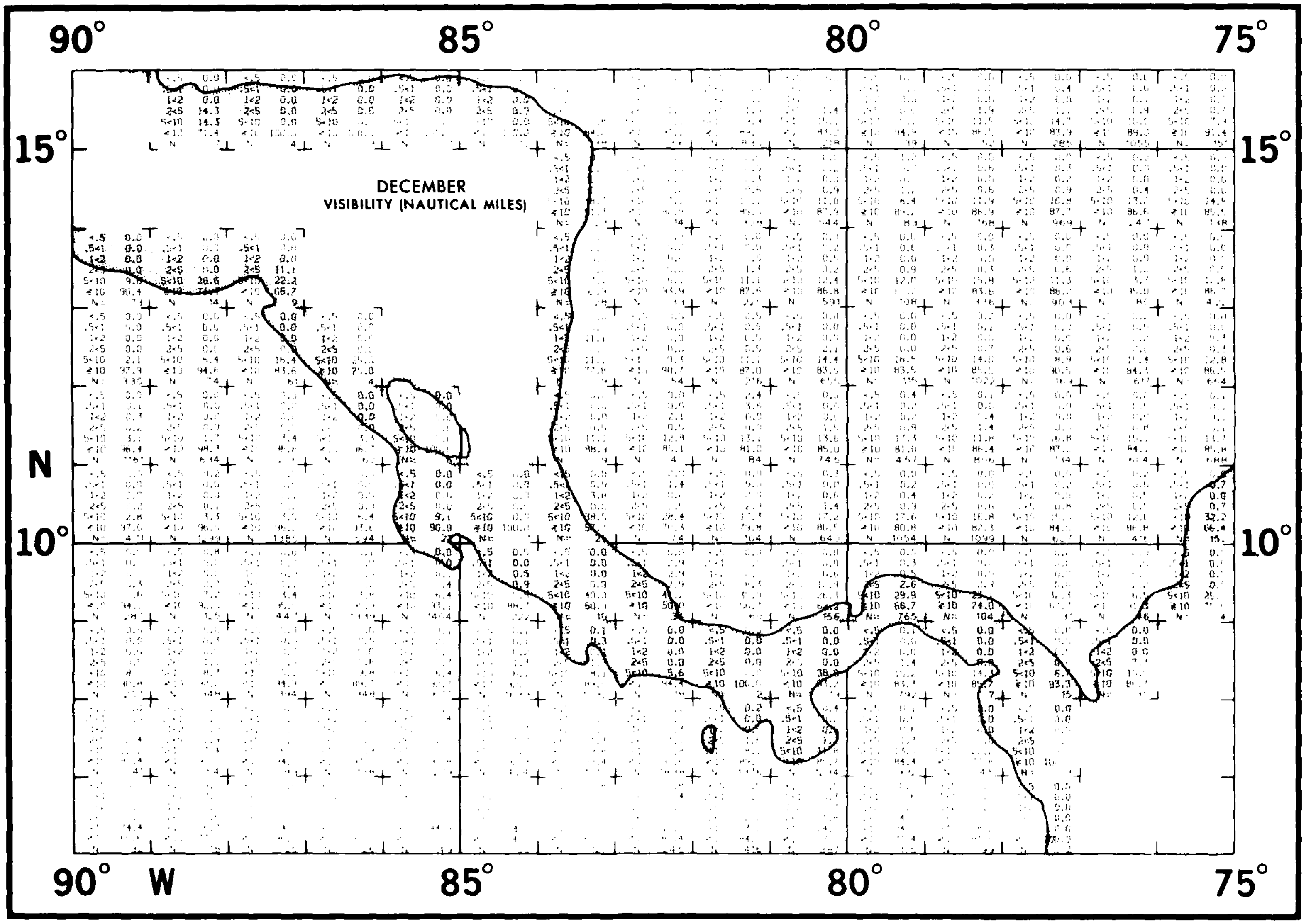

NOVEMBER
WAVE HEIGHT-FREQUENCIES
≤2 10.0 PERCENT FREQUENCY OF
3-4 20.0 VARIOUS RANGES WITHIN ONE-
5-6 30.0 DEGREE QUADRANGLES.
7-9 20.0 EXAMPLE:
10-12 10.0 30.0% OF ALL OBSERVED WAVE
≥13 10.0 HEIGHTS WERE IN THE RANGE 5
N = 1363 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES
WERE SELECTED FROM THE HIGHER
OF SEA OR SWELL WHEN BOTH
WERE REPORTED.
90°
85°
25°
N
20°
20°
90° W
85°
80°
75°

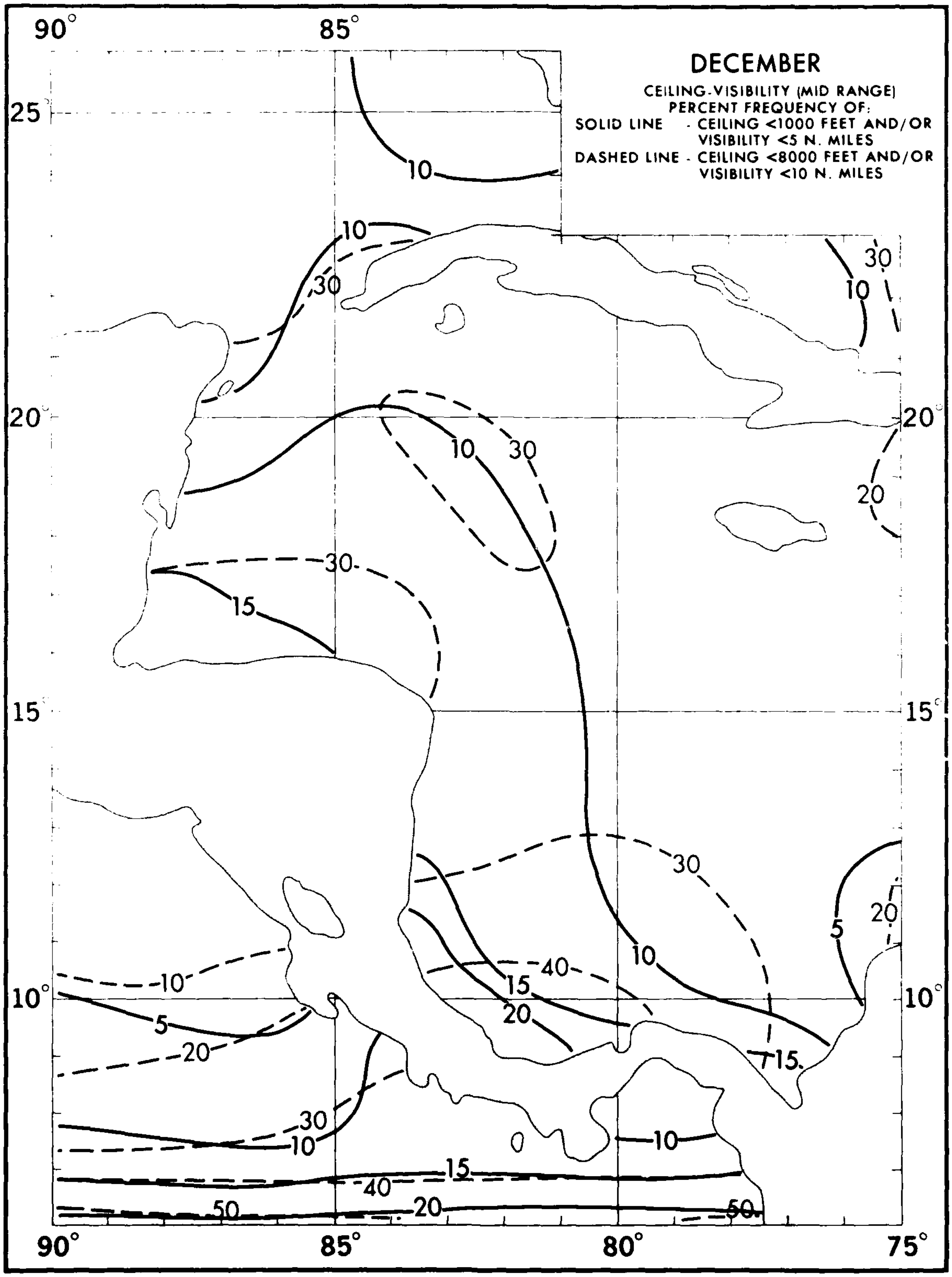

NOVEMBER
WAVE HEIGHT-FREQUENCIES
90°
85°
80°
75°
15°
10°
N
W


DECEMBER
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
90°
85°
80°
75°
25°
20°
15°
10°

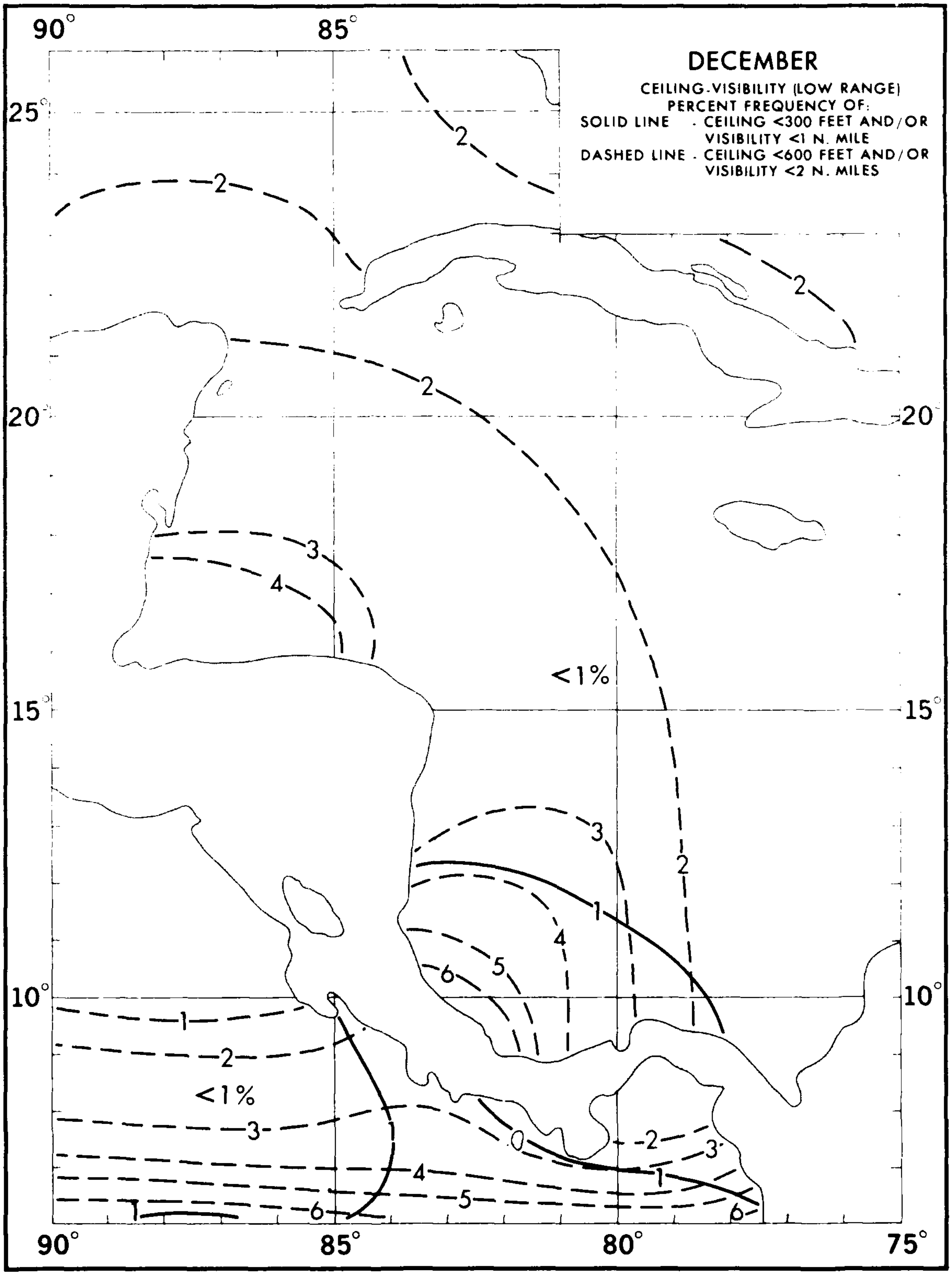

DECEMBER
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
90°
85°
80°
75°
25°
20°
15°
10°

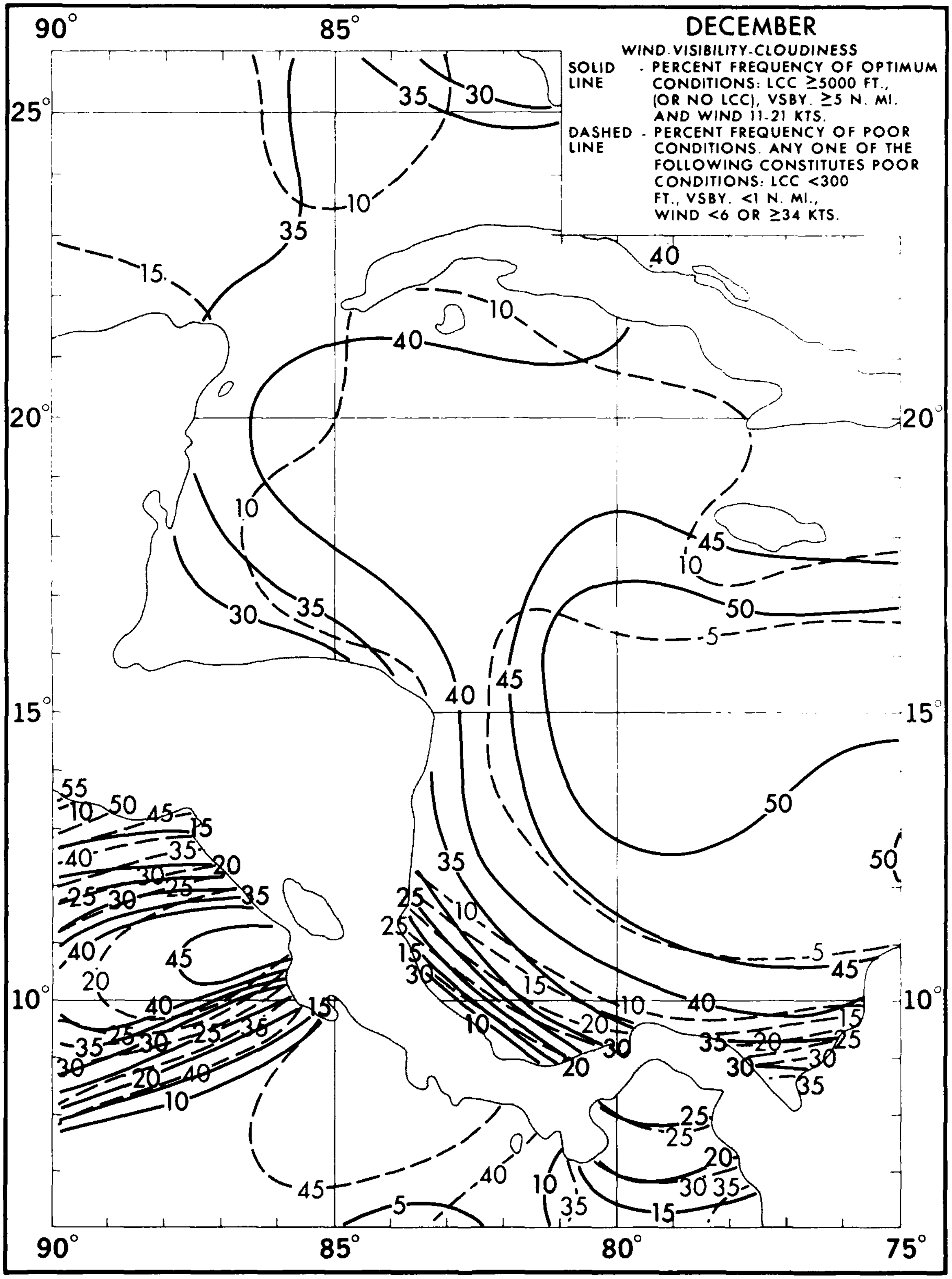

DECEMBER
VISIBILITY (NAUTICAL MILES)
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
90°
85°
25°
N
20°
90° W
85°
80°
75°
20°


DECEMBER
VISIBILITY (NAUTICAL MILES)
90°
85°
80°
75°
15°
N
10°
W

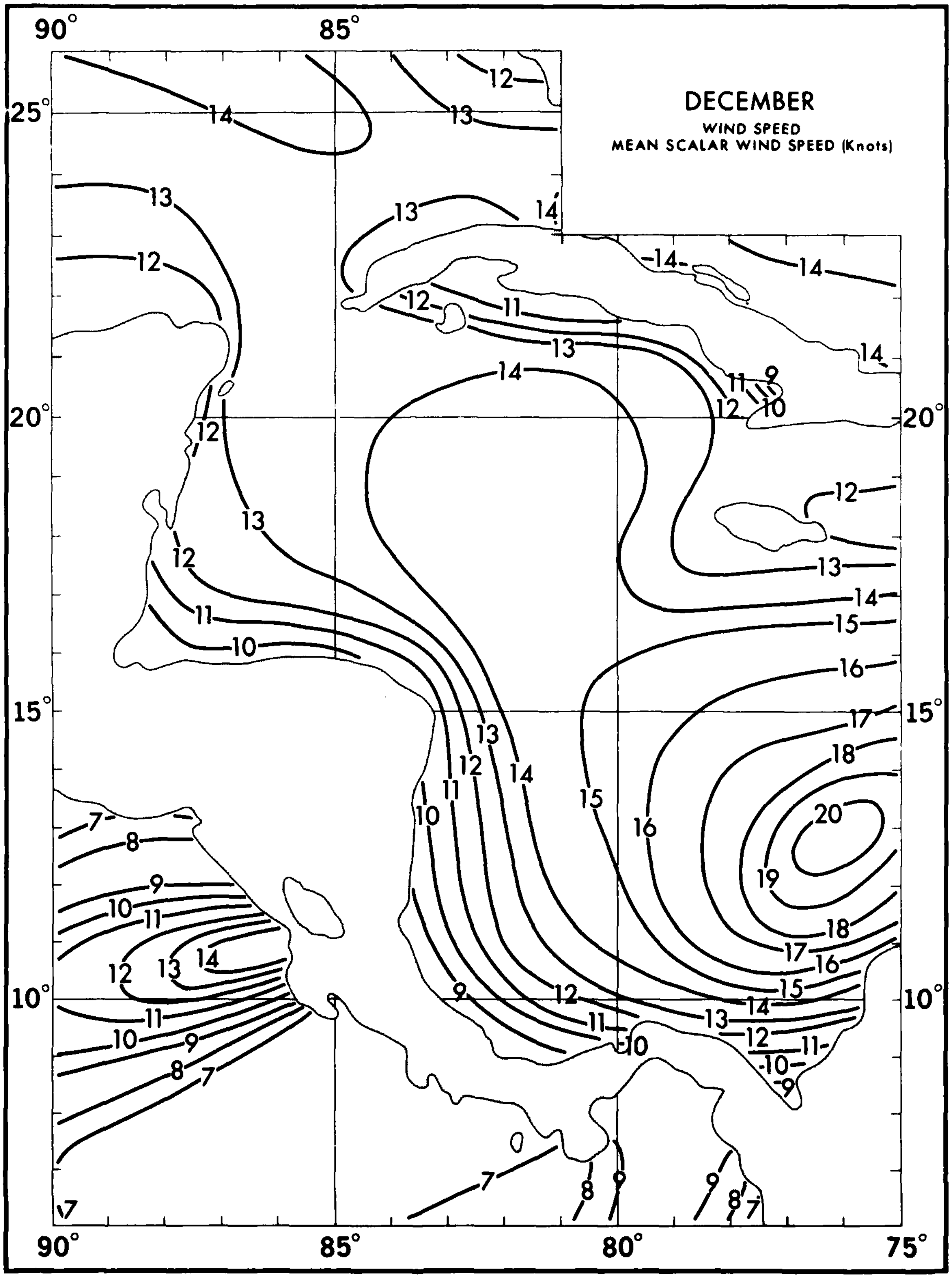


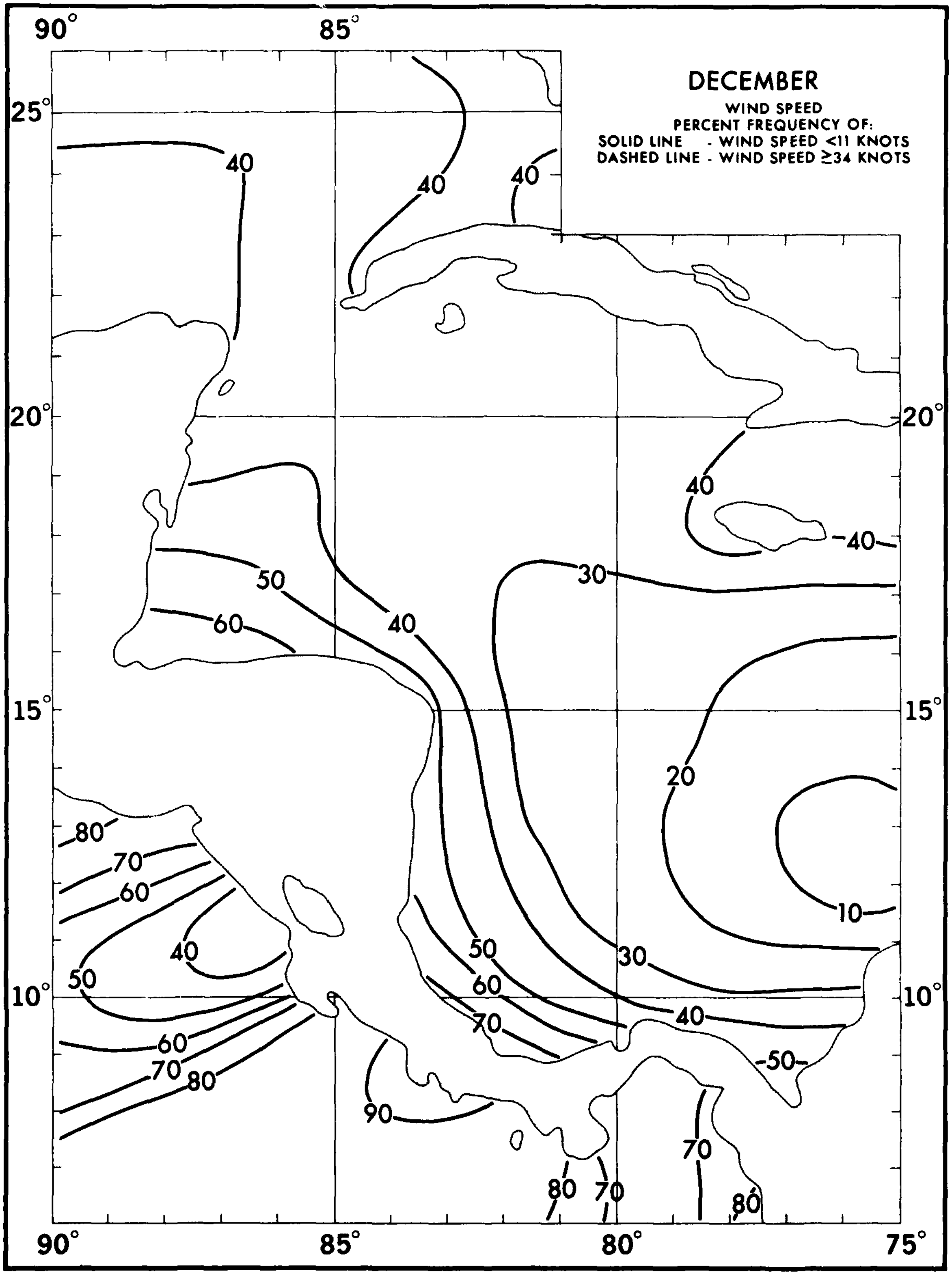
DECEMBER
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°

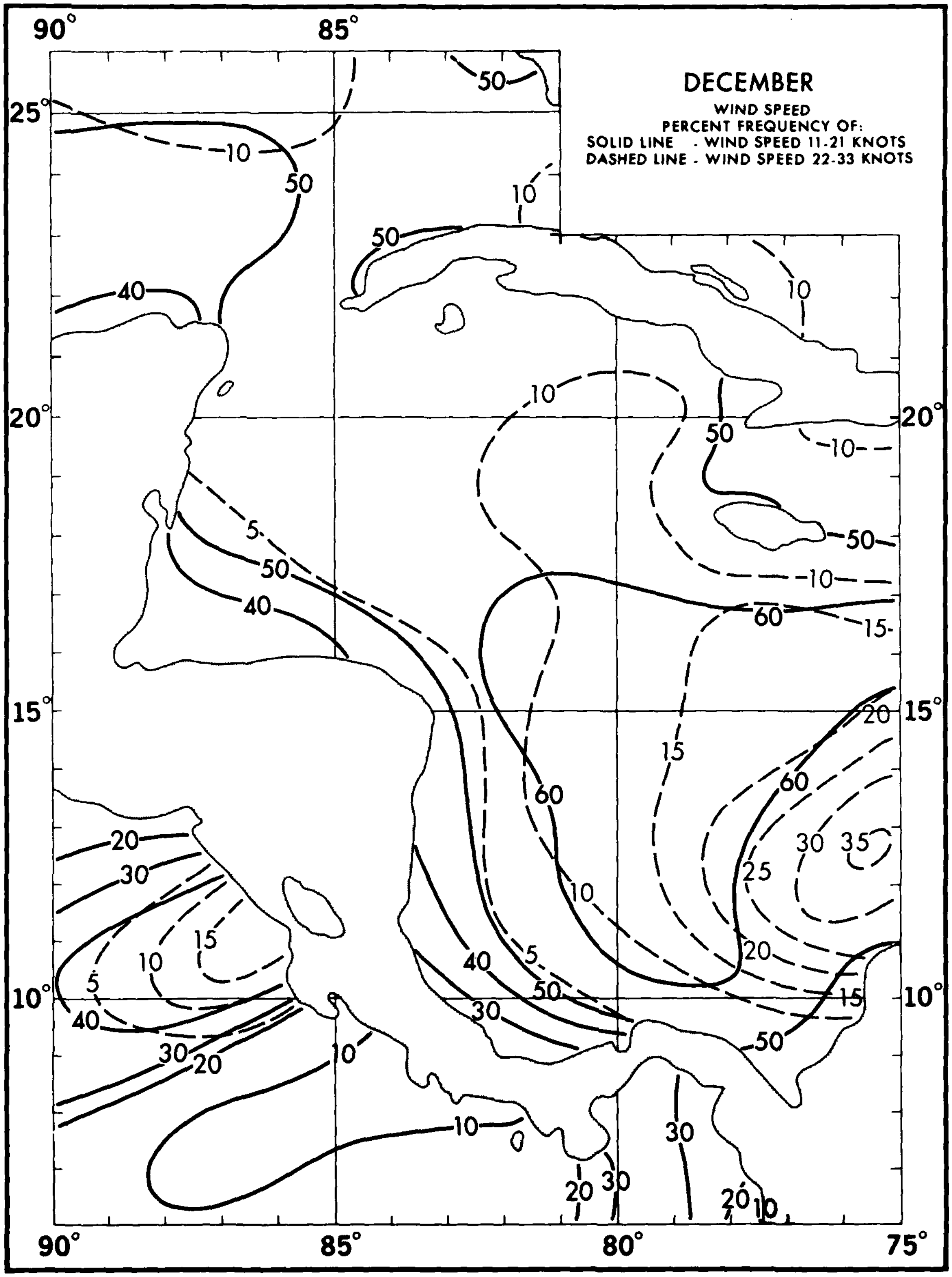

DECEMBER
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
90°
85°
80°
75°
25°
20°
15°
10°
<1%
<1%

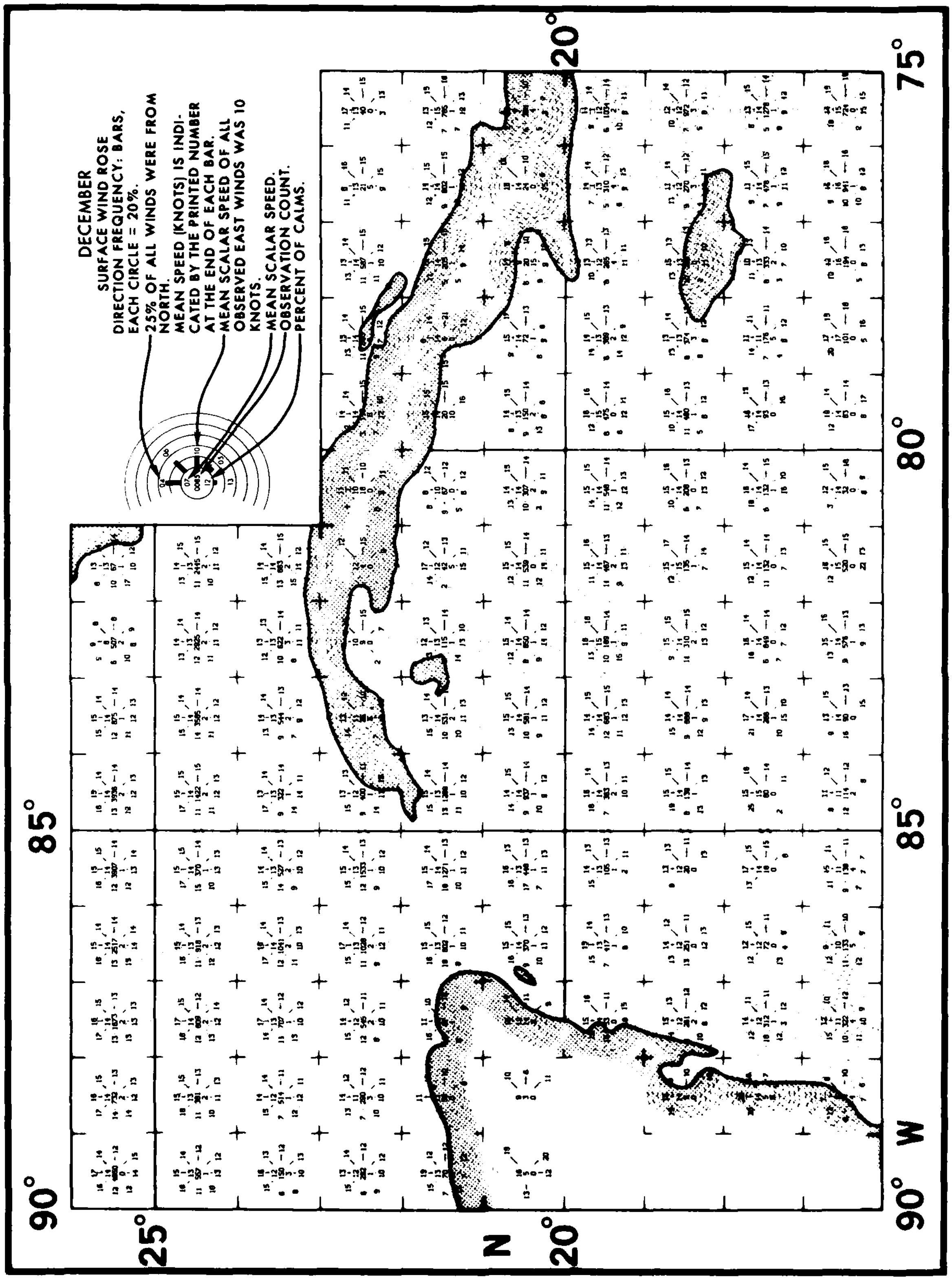


DECEMBER
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
90°
85°
80°
75°
25°
20°
15°
10°

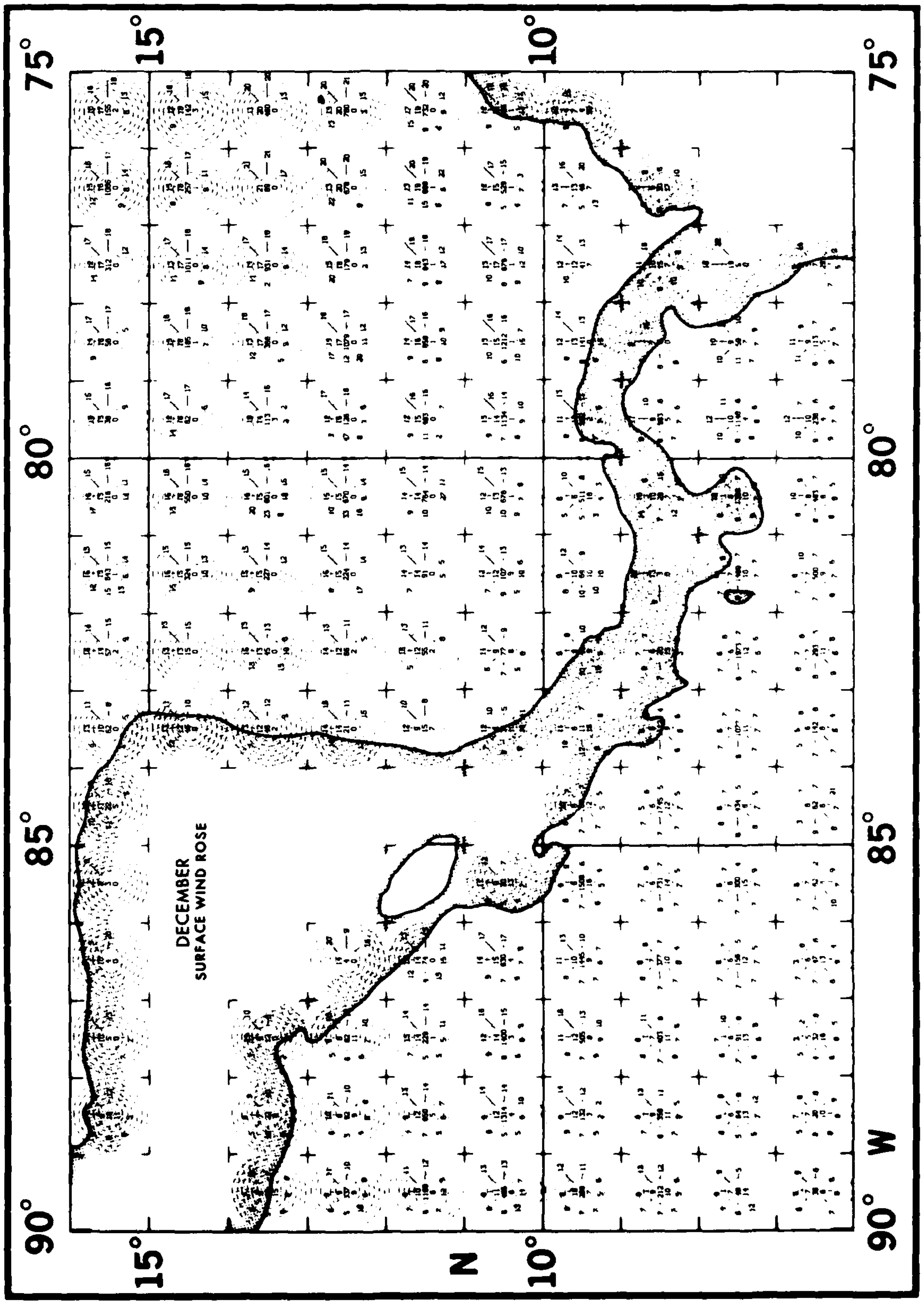

DECEMBER
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
90°
85°
80°
75°
25°
20°
15°
10°

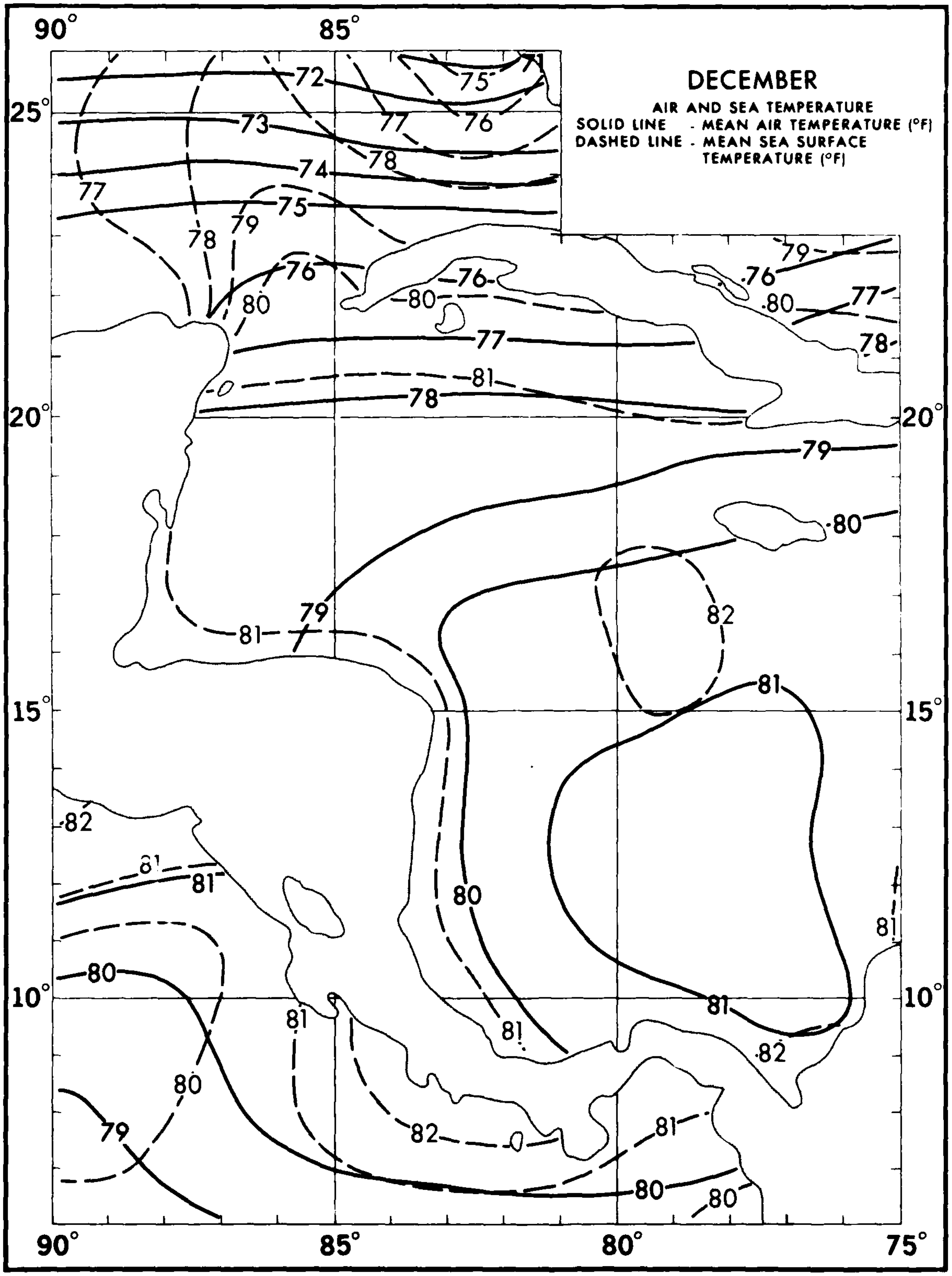

DECEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°
40
30
20
10
50
60
70
80
90

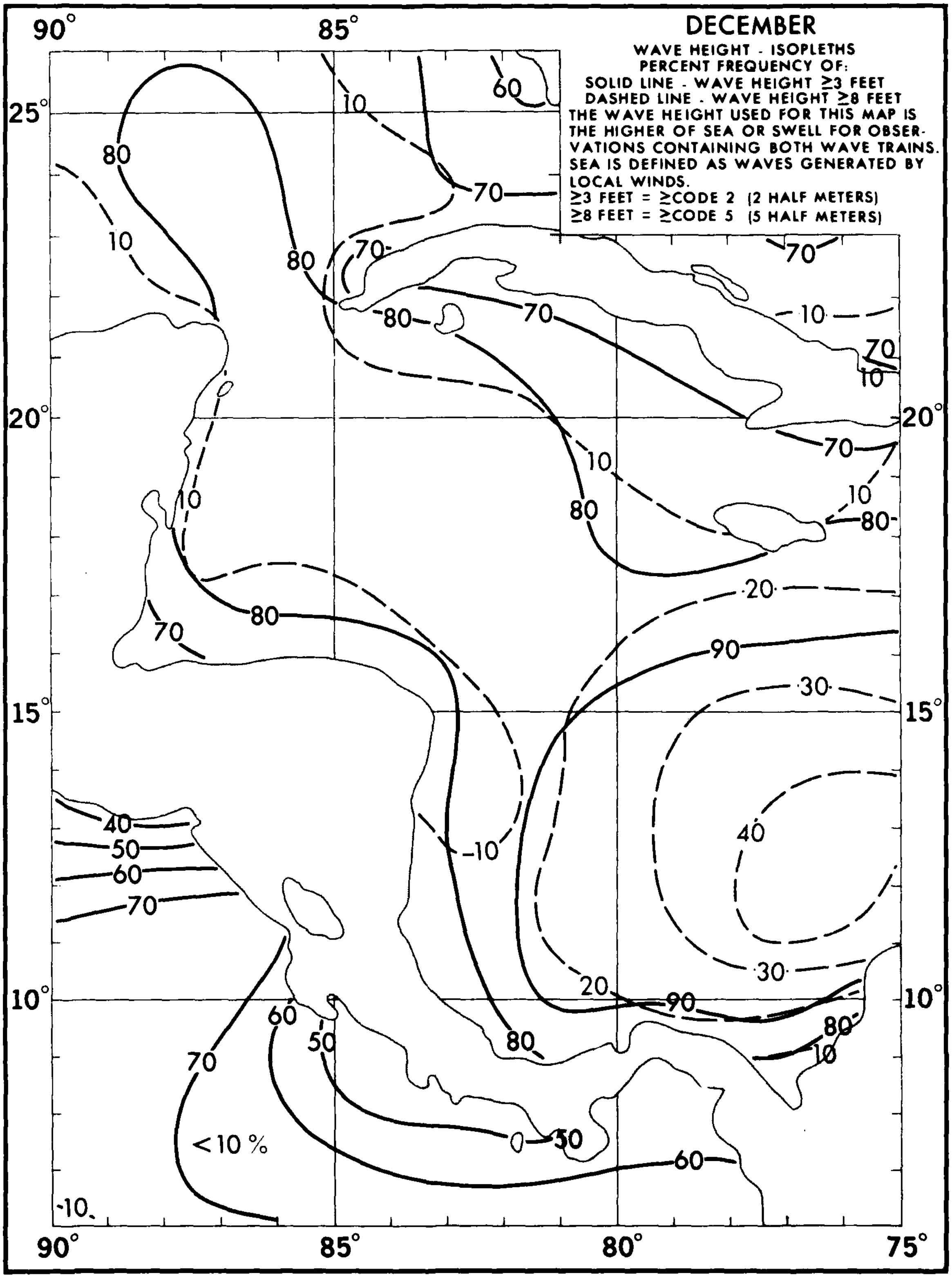

DECEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
90°
85°
80°
75°
25°
20°
15°
10°

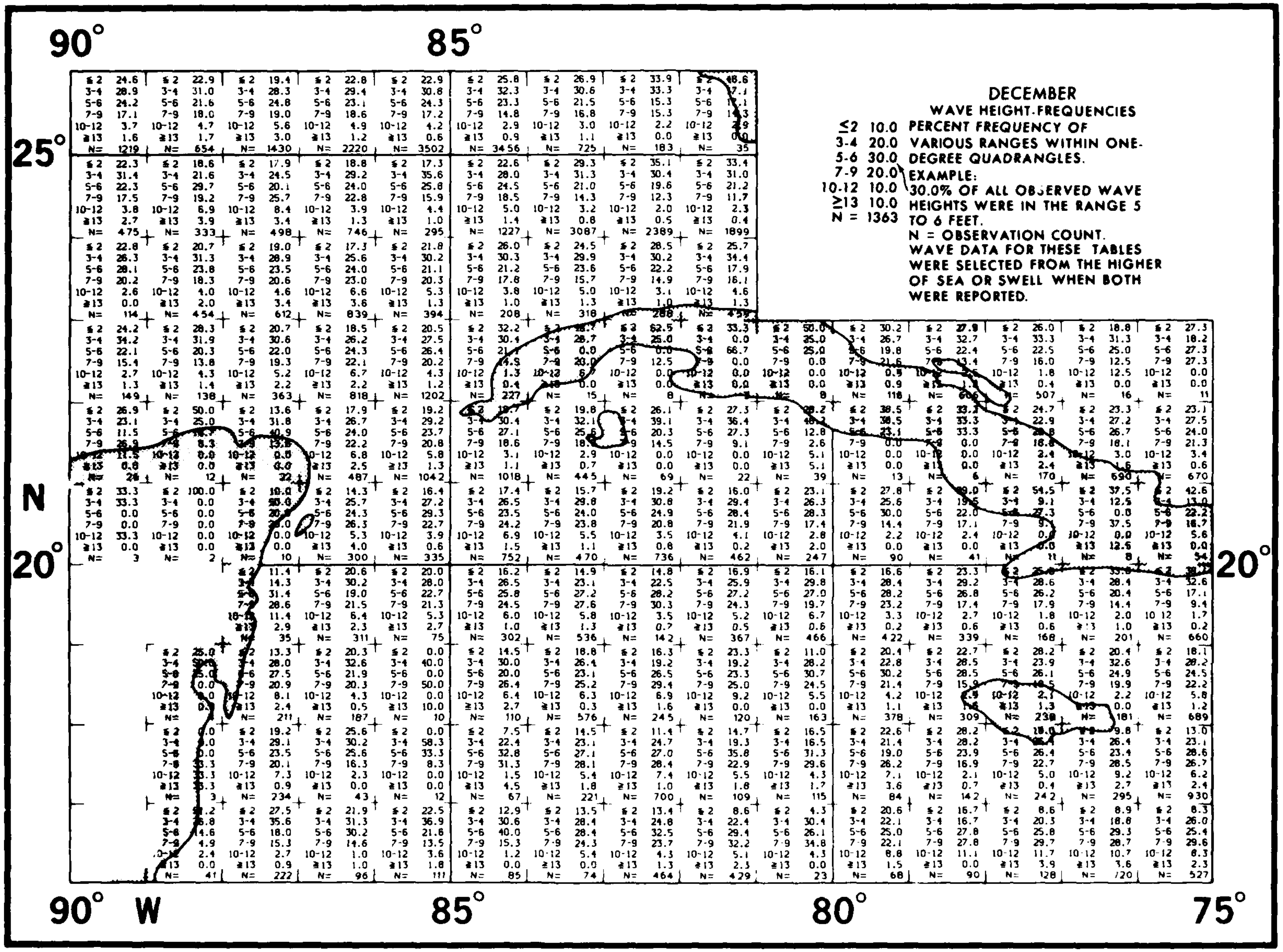


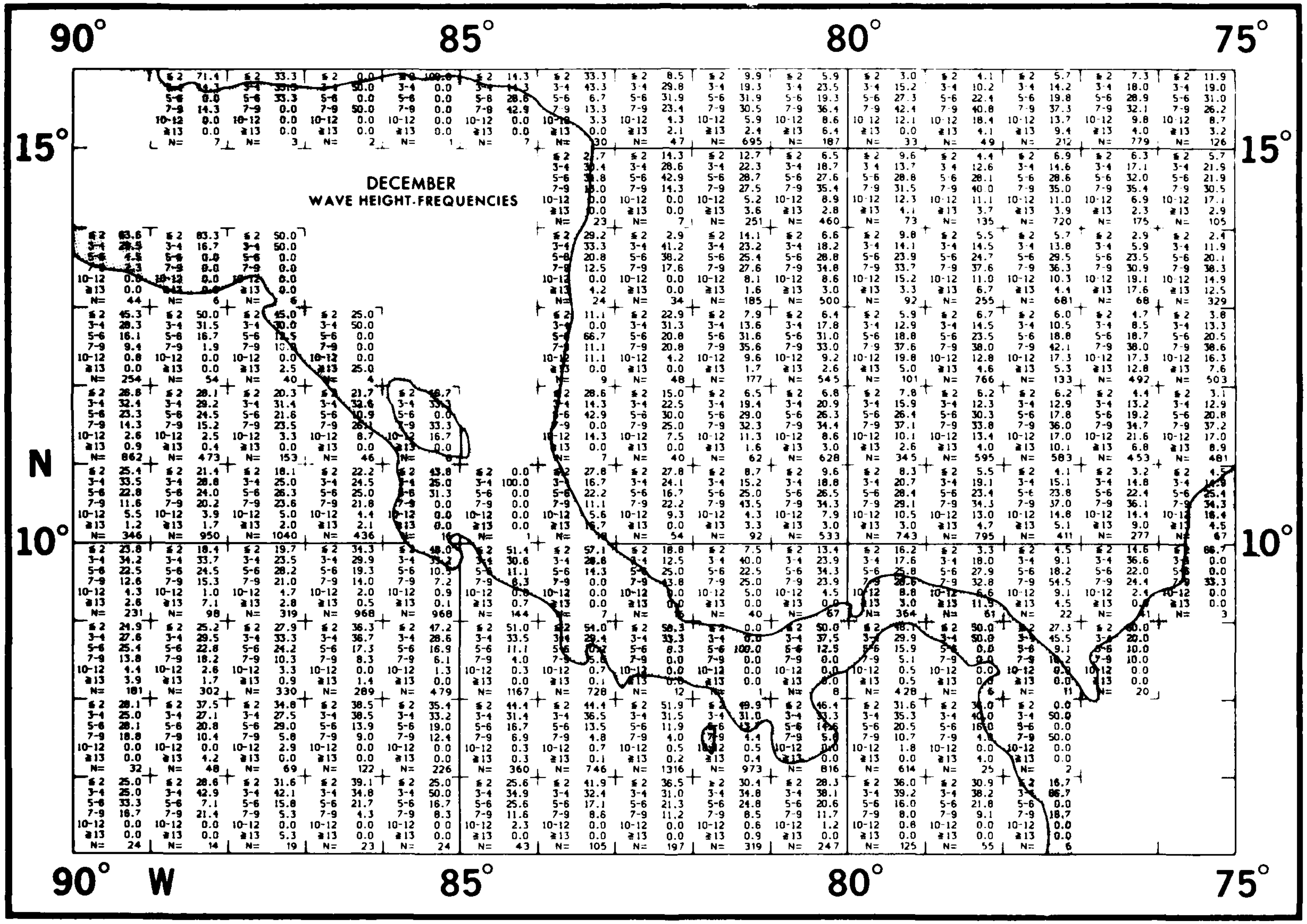
DECEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
90°
85°
80°
75°
25°
20°
N
W

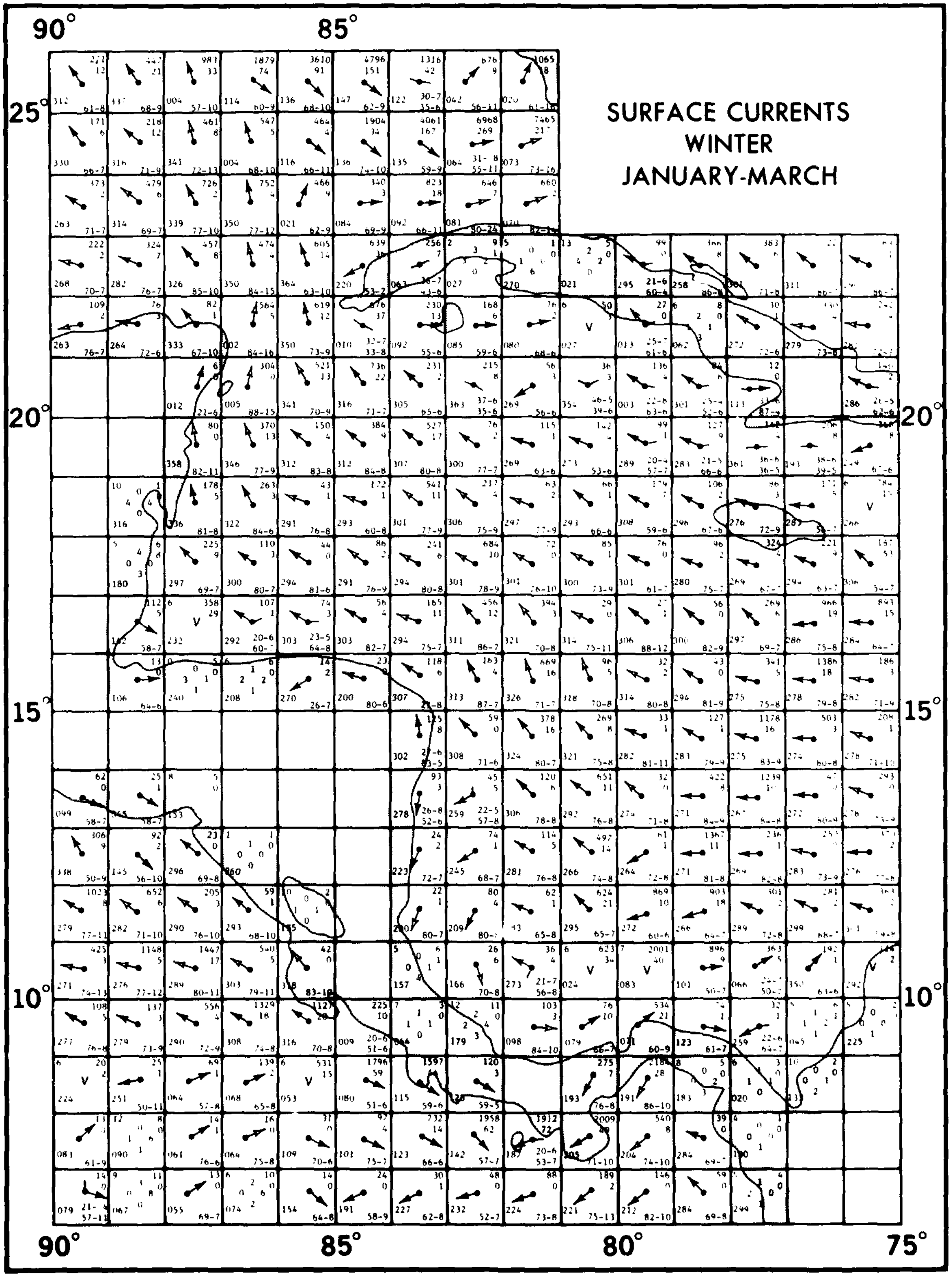

DECEMBER
SURFACE WIND ROSE
75°
80°
85°
90° W
15°
N
10°

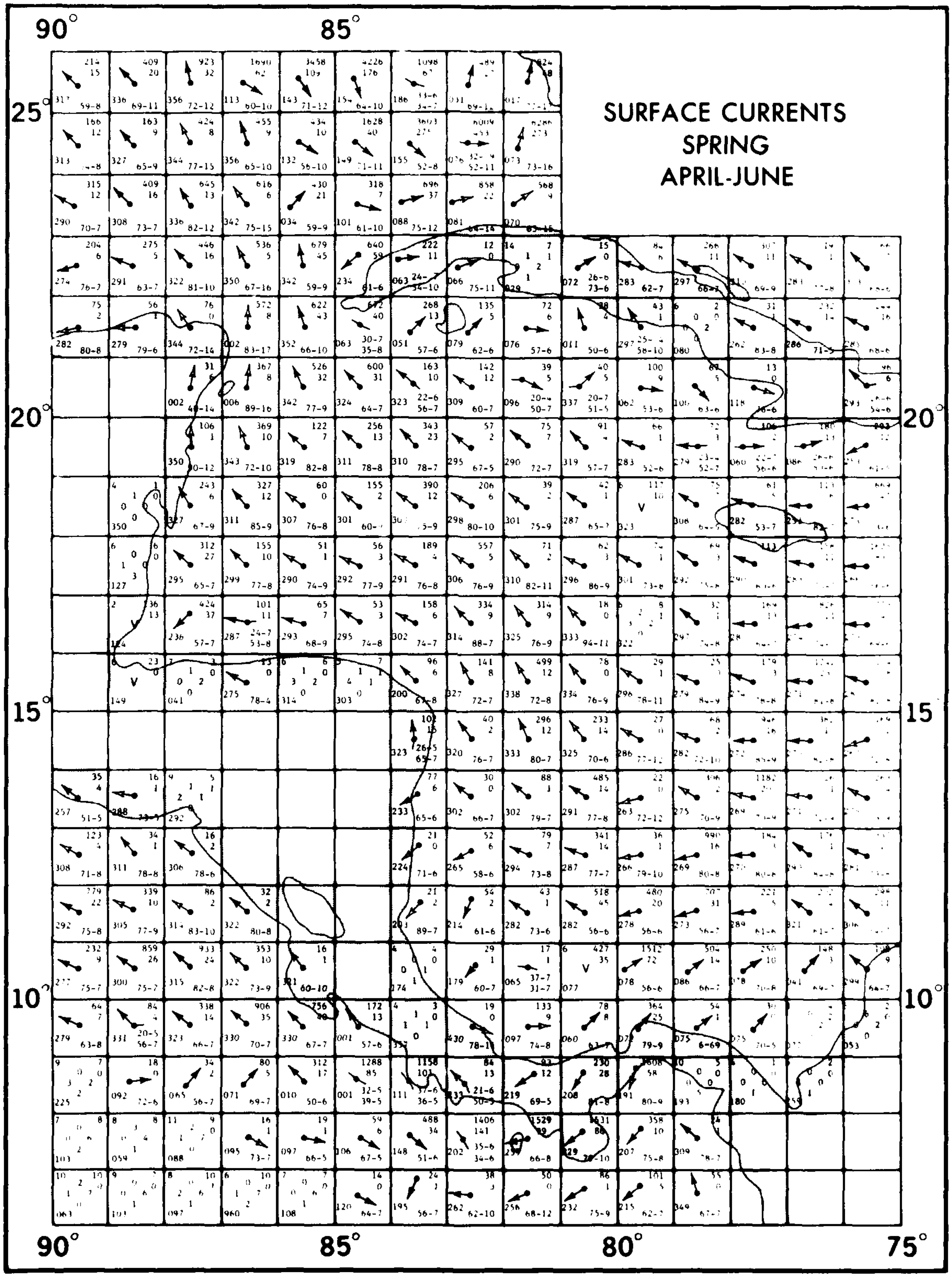

DECEMBER
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
90°
85°
80°
75°
25°
20°
15°
10°
72
73
74
75
76
77
78
79
80
81
82


DECEMBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS. SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
90°
85°
80°
75°
25°
20°
15°
10°
<10 %


DECEMBER
WAVE HEIGHT-FREQUENCIES
≤2 10.0 PERCENT FREQUENCY OF
3-4 20.0 VARIOUS RANGES WITHIN ONE-
5-6 30.0 DEGREE QUADRANGLES.
7-9 20.0 EXAMPLE:
10-12 10.0 30.0% OF ALL OBSERVED WAVE
≥13 10.0 HEIGHTS WERE IN THE RANGE 5
N = 1363 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES
WERE SELECTED FROM THE HIGHER
OF SEA OR SWELL WHEN BOTH
WERE REPORTED.
90°
85°
80°
75°
W
25°
20°
N


DECEMBER
WAVE HEIGHT-FREQUENCIES
90°
85°
80°
75°
15°
10°
N
W


SURFACE CURRENTS
WINTER
JANUARY-MARCH
90°
85°
80°
75°
25°
20°
15°
10°

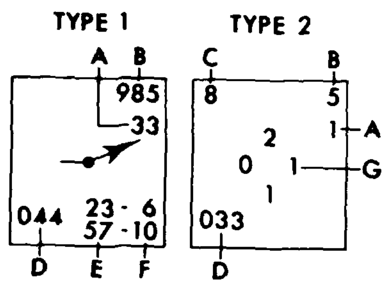


SURFACE CURRENTS
SPRING
APRIL-JUNE
90°
85°
80°
75°
25°
20°
15°
10°

SURFACE CURRENTS

Data Presentation

The following legend shows two types of surface current presentations by 1° quadrangle, type 1 with 12 or more observations and type 2 with fewer than 12 observations. Where there are 11 or fewer observations within a 1° quadrangle, the total number of observations is shown within the 90° quadrant containing the observations.



A Number of calms (included in total observations).

B Total observations

C Mean speed (0.8 knot) for all observations.

D Vector resultant direction (°T) for all observations.

E Percent frequencies (57% primary direction, 23% secondary direction).

F Mean speeds (1.0 knot primary direction, 0.6 knot secondary direction).

G Number of observations by quadrant.

Type 1 - If there are 12 or more non-calm observations in a 1° quadrangle, the surface current is depicted by vector resultants as follows:

Persistent Current - 60 percent or more of all observations fall within a 45° sector of the 8-point compass.

Primary Current with Secondary Direction - Primary Current - 50 percent or more of all observations fall within three adjacent 45° sectors. Secondary Direction - 20 percent or more of all observations fall within a 45° sector, and the two resultant vector directions are separated by more than 90° of arc.

Prevailing Current - 70 percent or more of all observations fall within two adjacent 45° sectors.

Bizonal Flow - Practically all observations are concentrated in opposite pairs of 45° sectors, and one pair contains at least 80 percent as many observations as the opposite pair. This generally indicates variability that occurs in zones of entrainment between opposing currents.

V Variable Current - The 45° sector with most observations has less than 25 percent of all observations; direction is indeterminate.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A160 159	3. RECIPIENT'S CATALOG NUMBER
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		6. PERFORMING ORG. REPORT NUMBER
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9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Oceanography Command Detachment Federal Building Asheville, NC 28801-2696		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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		15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This climate study consists of monthly charts and tables of (1) clouds, (2) visibility-tables, (3) ceiling-visibility (mid range), (4) wind-visibility-cloudiness, (5) scalar mean wind speed, (6) wind speed < and ≥ 34 knots, (7) wind speed 11-21 and 22-33 knots, (8) air and sea temperature (9) surface wind roses, (10) wave height-isopleths, (11) wave height-tables, (12) surface currents (seasonal), and station climatic summaries.

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